

Preliminary assessment of using mobile point-of-care human papillomavirus (HPV) testing with the option of immediate colposcopy in a rural area in a high-income country: a case study

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ABSTRACT

AIM: Cervical cancer is now preventable with human papillomavirus (HPV) vaccination and HPV screening. However, structural health system barriers in rural areas can inhibit screening access. Inequitable access for rural Māori is exacerbated by social determinants and racism. Pro-equity tools, such as self-taken swabs point-of-care (POC) testing, now exist. This study aimed to investigate whether POC HPV testing and immediate offer of colposcopy by a mobile colposcopy service is possible at a rural community event.

METHODS: This case study was a collaboration between a research centre, a women's health bus, a molecular diagnostics company, a Māori health provider and a community charity, and took place prior to the new cervical screening programme introduction at a 2-day community event—a shearathon. Eligible participants were offered a self-taken swab for HPV, which was analysed by POC testing. If high-risk HPV was detected, they were offered an immediate colposcopy. The Māori-centred qualitative component explored women's experiences of the process.

RESULTS: Fourteen women undertook a self-test for HPV. High-risk HPV was detected in six women and all were offered immediate colposcopy. Six women were interviewed. All were supportive of the service. Culturally safe staff taking time to put women at ease contributed to acceptability and positive experiences.

CONCLUSION: This case study shows that provision of POC HPV testing and colposcopy at a rural community event setting is possible through cross-sector collaboration. This service was acceptable to rural transient workers who face barriers to healthcare in a high-income country.

Cervical cancer is preventable with human papillomavirus (HPV) vaccination and screening.¹ Screening can detect treatable pre-cancer of the cervix, halting the development of a potentially fatal outcome.² The World Health Organization (WHO) has called for the elimination of cervical cancer.³

The causative agent of cervical cancer is HPV. Infection with certain oncogenic types of HPV (known as high-risk or HrHPV) causes changes in the cells of the cervix that can lead to cancer.⁴ In this paper we will use HPV to indicate HrHPV. Compared with cytology, HPV-based screening is a more sensitive test; it provides 60–70% greater protection against developing invasive cervical cancers.^{5,6} It is also internationally recognised that a self-taken swab (HPV self-test) analysed using

molecular amplification tests such as polymerase chain reaction (PCR) is as effective at detecting HPV as a clinician-taken sample.⁷ HPV self-testing is an equity tool for cervical screening. It has been shown to be acceptable to under-screened wāhine Māori, and a randomised controlled trial showed that offering HPV self-testing achieved nearly three times the screening rates of offering cervical cytology.⁸ Aotearoa New Zealand introduced a new National Cervical Screening Programme (NCSP) in September 2023 using HPV testing as the primary screening test to prevent cervical cancer.⁹

Most cervical cancers occur in women (wāhine) and people with a cervix who have either not received screening or screened less frequently.¹⁰ Structural health system barriers such as limited availability of healthcare in rural areas can

inhibit access to screening. Inequitable access for rural Māori is further exacerbated by social determinants, systemic failures in healthcare and racism.^{11,12} The lower part of Te Waipounamu (South Island of Aotearoa New Zealand) is predominantly rural, with a low population density and with the main centres situated on the periphery of the area. The 2023 screening coverage data for this region shows that the overall screening coverage was 72%. However, this was only 61.9% for Māori, 60.7% for Pacific peoples and 54.7% for Asian women. As of January 2023, over 25,000 of the eligible population in this region had not been screened.¹³ The same structural barriers contribute to a failure to provide timely and equitable diagnostic colposcopy after abnormal cervical cytology for women in rural Aotearoa New Zealand, and particularly wāhine Māori.^{10,14} Once screened, there is a failure to achieve timely diagnosis and treatment of abnormalities for Māori.¹⁰ Fewer wāhine Māori have a colposcopy within an appropriate timeframe following a high-grade abnormality when compared to non-Māori women. Furthermore, the proportion of women who had no record of any subsequent follow-up at 90 days is 4.4% for NZ European but 8.6% for wāhine Māori.¹⁵ Recent evidence from Aotearoa New Zealand also shows that the current cervical screening programme does not serve the transgender and non-binary population well.¹⁶

Point-of-care technology (POC) enables on-site HPV testing of self-collected vaginal swabs. The Cepheid Xpert HPV test (CA, USA) is clinically validated to detect infections with 14 HPV types (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68) associated with over 90% of cervical cancers.^{7,17,18} The Xpert HPV test differentiates types HPV16 and HPV18/45, which cause ~70% of cervical cancers. The non-16/18/45 types are grouped together and referred to as HPV “other”. The sensitivity and specificity of the Xpert HPV test are comparable to the other well-established HPV central laboratory-based assays, and it fulfils the WHO criteria for use.¹⁹ POC testing can be administered and run by non-laboratory staff, such as nurses or kaiāwhina (non-clinical health workers), when suitable accredited training and audit processes are in place. POC testing has the potential to increase equitable access^{7,20–22} to cervical screening, because it can be implemented in a range of settings. Equitable access to cervical screening and follow-up could be further facilitated by co-locating HPV self-testing, POC and immediate diagnostic colposcopy. Implementing this co-located

pathway in rural community event settings in a high-income country has not been fully explored previously.

The aims of this case study were to:

1. Investigate whether POC HPV testing and immediate offer of colposcopy by a mobile colposcopy service is possible at a rural community event.
2. Explore participant experiences of accessing cervical screening and healthcare, including acceptability of POC HPV testing and immediate offer of colposcopy by a mobile colposcopy service at a rural community event.

Methods

This case study was a cross-sector collaboration between Te Waka Wahine Hauora – The Woman’s Health Bus (a clinical mobile health service), Te Tātai Hauora o Hine (National Centre for Women’s Health Research Aotearoa), Cepheid (the molecular diagnostics company who provided the GeneXpert® IV instrument), Uruuruwhenua Health (a Māori community health non-governmental organisation) and Shear 4 A Cause 24-hour Shearathon. The staff who ran this case study included a gynaecologist (also the bus driver), a nurse colposcopist, a molecular scientist to run the POC testing, two community health workers to support the women and two researchers to consent the women and conduct interviews.

Shear 4 A Cause is a 24-hour sheep shearing event that has been run in the lower part of Te Waipounamu (rural Otago) for 3 years, raising funds for charities. In February 2023, one of the benefiting charities was Talk Peach, a gynaecological oncology awareness charity, which led to an invitation for Te Waka Wahine Hauora to attend the event. The environment was a rural farm next to a shearing shed located 150km (2 hours’ drive) from the nearest referral centre for colposcopy and 35km away from the nearest town. There was no Wi-Fi available and very little cell phone coverage at this site. Negotiation with an on-site commercial media company live-streaming the event provided temporary access to their microwave feed.

Te Waka Wahine Hauora (the bus) is a mobile health service with AAA-NZ accreditation. It is a free-standing 8.5m purpose-built campervan that includes heat/air-conditioning, a toilet, a clinical consultation area and an examination space with

a gynaecological bed (www.womanshealth.nz). It has a total tonnage under 5t to enable driving with a normal New Zealand Class 1 license. The clinical space is powered by an in-built petrol generator. Colposcopy is performed using an Eva mobile colposcope to enable image capture and sharing with a patient screen and a Zeiss mobile colposcope.

POC set up and process

An outdoor laboratory space for POC HPV analysis was set up in a 3m-by-3m marquee-style tent with three sides closed to block sun and wind. The front of the tent remained open for ventilation and for participants to see the testing process if they wished. The floor of the tent was covered in cardboard, and two 1.8m by 0.76m trestle tables provided laboratory surfaces to hold the GeneXpert® IV, the laptop for instrument control and the sample preparation area. Electricity was supplied by the mobile clinic generator.

A self-collected vaginal FLOQSwab® (Copan, Italy) was transferred to a 20mL vial of ThinPrep® (Hologic, USA), the swab handle shortened using scissors and the vial capped. The sample in ThinPrep® was vigorously vortexed for 30 to 60 seconds and 1mL immediately transferred to the GeneXpert® IV HPV cartridge (Cepheid, CA, USA). Patient details were entered into the run log (either the NHI number or patient name, depending on what was available) and the sample set to run as per manufacturer's instructions. Each run took 1 hour. Laboratory surface areas and equipment were wiped with a 10% bleach solution regularly and between patients to cope with accumulated dust from the shearing shed environment. No testing was undertaken until the laboratory set-up and performance of the full system passed quality control using samples of known provenance.

Inclusion criteria

Eligible participants were women or people with a cervix between the age of 25–69.9 years whose cervical screening was due or overdue. Eligibility was confirmed using the NCSP register. When there was no access to the NCSP register due to lack of Wi-Fi, eligibility was determined by asking the woman about her screening history.

Recruitment and HPV testing

Participants were recruited opportunistically from shearing gangs and those attending the event as observers and supporters. Participants

provided informed consent and were offered an HPV self-test. If requested, sampling for other sexually transmitted infections was offered but processed off-site. Women could do the self-test in the toilets provided for the event, or on the bus. Alternatively, they could request that a clinician take the vaginal swab.

The vaginal swab was processed immediately using the GeneXpert® IV operated by the molecular biologist on the research team (Te Tātai Hauora o Hine, National Centre for Women's Health Research Aotearoa), who is an expert in POC testing. Results were available in 1 hour, and healthcare staff advised participants of the result by text or in person. If the result was negative, i.e., no HPV detected, the woman was advised that she would not need HPV screening for 5 years. If the test detected HPV (16/18/45 or "other"), the woman was given the result with information and support. She was then offered an immediate colposcopy on the bus, or a referral to a colposcopy service (including colposcopy clinics provided by the bus at a later date). If the participant was registered with a primary healthcare provider, and with her permission, a letter was later sent to the provider with this information.

Qualitative methodology

The qualitative component was Māori-centred and undertaken by a senior Māori researcher. It explored women's current and previous experiences of accessing healthcare and cervical screening. Women were eligible for inclusion if they accessed the Woman's Health Bus. They were asked during the consent process to consider being interviewed, and those who signalled an interest undertook a further informed consent process. One-off semi-structured interviews were completed at the Shearathon in tents and cars on site. Kōrero (conversations) were audio recorded and transcribed verbatim. Data were uploaded to NVivo, a qualitative data analysis software program (QSR International Pty Ltd, 2018). Transcripts were coded inductively and analysed using reflexive thematic analysis.^{23,24}

Ethics

The protocol was reviewed by the national Health and Disability Ethics Committee. Ethical approval was covered by two existing HPV studies: Rural Empowerment (HDEC 20/NTB/311) and Te Ara Waiora - Implementing HPV primary testing to prevent cervical cancer in NZ: Te Tai Tokerau (HDEC 21/STH/188).

Funding

The study was funded by the Health Research Council of New Zealand (HRC 20/550). Cepheid loaned the GeneXpert® IV.

Results

Achievability

Twenty-one participants used the “no cost to person” sexual and reproductive healthcare services on offer through the mobile clinic. There were 14 POC HPV tests performed. High-risk HPV was detected in six of the 14 patient samples using the GeneXpert® IV POC test. Mixed viral types (HPV18/45 and HPV “other”) were detected in two samples, and HPV “other” was detected in four samples. Of the participants who had a positive HPV result, two chose to have a colposcopy on the day, with four deferring for a variety of reasons. Women who elected to defer were booked in with either a hospital or with Te Waka Wahine Hauora at its usual mobile clinic sites.

There were challenges to this venture (see Table 1). The main challenge was lack of internet. This impeded access to the NCSP register to check if people were due a cervical screen. It also inhibited the writing of medical notes with reporting to the NCSP using Solutions Plus, which is an internet-dependent patient management system. Another challenge was visibility and identification of the bus. Despite advertising on Facebook® about the availability of the bus at the Shearathon, often people at the event were not aware of the purpose of the bus, mistaking it for a mobile home. The weather at the event had an impact, including significant wind, rain, dust and temperatures reaching 35°C. It was difficult to provide a confidential, safe space to explain the health services and research in these conditions.

Factors that contributed to the success of the project included the cross-sector partnership, multidisciplinary expertise, building on existing relationships, an invitation from the community and the willingness of all partners to quickly resource the venture (Figure 1). Our collaboration with Uruuruwhenua Health, a Māori community health organisation, was critical in engaging and sustaining community awareness and support of our service. Talk Peach is one of the charities supported by the Shearathon, and both Talk Peach and Shear 4 a Cause provided the opportunity by inviting Te Waka Wahine Hauora to attend the event. All partners had recognised the importance of this novel opportunity and were willing to act in

response to the invitation. Talk Peach supported the no-cost provision of sexual and reproductive healthcare including colposcopy, provided by the clinicians on Te Waka Wahine Hauora. Te Tātai Hauora o Hine provided the expertise in HPV and POC. The existing trusted relationships between Te Waka Wahine Hauora, Te Tātai Hauora o Hine, Cepheid and Southern Community Laboratories meant that the bus, equipment, research time and expertise could be mobilised quickly and provided at no cost for this event.

Qualitative findings—accessibility and acceptability

Six women, aged between 24 and 45 years, participated in an interview. Two participants were wāhine Māori and four were NZ European. When asked about access to healthcare and cervical screening, three main themes emerged: 1) the value women placed on health and wellbeing for their whānau (family) and themselves, 2) practicalities of accessing primary care for a transient population who work long hours, and 3) accessibility and acceptability of the bus. First, access to healthcare was discussed in terms of women looking after themselves but also their partners, children and wider whānau.

“My partner is full-time shearing ... I feel like I've helped him with some good food choices and helped him get some training underway.” – Participant 1

“I kept up with all their [whānau] injections. They all got COVID-19 shots. That's just how we are. We do it to protect ourselves.” – Participant 4

Structural barriers to accessing healthcare included difficulties enrolling in general practice and limited ability to book appointments. Shearing work requires transience, and finding a practice who could take on new patients was time consuming for women who work in shearing gangs.

“...You've just finished hard days at work, and you think, ‘Oh no, I've still got to ring the doctors.’” – Participant 7

Almost all participants described difficulties in securing an appointment with a healthcare provider. The main barrier was finding time. Those who worked in shearing gangs did not know their availability ahead of time, and generally found

out at 5 in the morning if they would be working.

“Because we are 7 days a week, you never really know that we’re going to have next Monday off, and you can’t get an appointment at the doctors.” – Participant 5

Participants were unanimous in their support of the bus. A health service that came to them and did not require an appointment was highly accessible. Culturally safe staff who took time to put the women at ease, introduced themselves and made connections also contributed to acceptability and positive experiences.

“We sort of had a different chat about work and then all of a sudden it was done ... Just a very bubbly ... I just got a good lady. You’ve got a bunch of good ladies, that’s what it is.” – Participant 6

Discussion

This case study shows that provision of POC HPV testing and colposcopy by a mobile health service in a rural community event setting is possible through community, clinical and research partnership.

This study identified how co-located HPV self-testing, POC and immediate diagnostic colposcopy can be implemented at rural community events. Factors that influenced provision of this novel pathway included both practical and technical aspects of care and the manner of care provision, i.e., care that prioritised the wellbeing of women and whānau.

The findings have implications for any mobile service considering provision of POC testing, implications for delivering healthcare at community events and for services considering novel modes of healthcare delivery for people whose needs are not met by mainstream healthcare models. It is difficult to compare with other studies using HPV self-testing and POC in the community, as in developing countries ablative treatment is offered rather than colposcopic diagnosis. However, two studies in Kenya and Uganda that piloted POC HPV testing in the community found that, similar to our case study, self-testing for HPV was more acceptable to many women who did not access healthcare easily, but there were many logistical challenges. A Ugandan study also used community fair events to reach women to good effect.^{21,22}

Our qualitative data emphasised the importance of whānau wellbeing. Shearing events are for the whole whānau. Manaakitanga (showing respect, generosity and care) to support people who choose to have their colposcopy on the day could include childcare, a relaxing space for recovery and refreshments. Not all people want immediate colposcopy, and it is critical to be linked into local services to enable access to an acceptable service in a time and place that is suitable for the patient.

Communities require trust to engage with healthcare and research. Our collaboration with Uruuruwhenua Health, a Māori community health organisation, was critical in engaging and sustaining community awareness and support of our service. Our collaborators in this case study have the connections and trust to ensure whānau experience awhi (a cloak of support) and feel safe to engage with the mobile health service.

Lessons learned include the need for a separate, private space for completing registration details, as people may not have engaged with health services and do not have their medical details readily available. Having a safe space and allowing time for informed consent around the procedure was also critical for patient understanding that a positive test leads to a recommendation for colposcopy. This case study is limited by a lack of available data about the study population, i.e., the number of eligible people attending the event, their ethnicity and screening history. People came from all over the country for this event, meaning that regional screening coverage data may not apply. Because the event took place before the release of the NCSP guidelines, we did not offer cervical cytology for HrHPV type “other” and cannot comment on participants’ experience of this. Also, although the women who tested negative will not require a screen for 5 years, the NCSP may call them earlier and the women were informed of this possibility.

A young film maker with crowdfunding also made a short documentary about the case study that has had national media attention (<https://thespinoff.co.nz/society/12-04-2023/the-struggle-for-access-to-cervical-screening-in-rural-aotearoa>).

Recommendations for future buses would include POC testing built into the design infrastructure of the mobile service, such that it is contained within an environmentally managed space. Vaccination could also be offered for the whānau who also attend. Future research work could include a cost–benefit evaluation for the mobile

Table 1: Challenges to implementation of offers of HPV self-tests, POC testing and colposcopy on a mobile bus at a rural event in Aotearoa New Zealand.

Challenges to implementation	Reason	Possible solutions
Lack of internet	<ul style="list-style-type: none"> • Writing medical notes in an internet-dependent patient management system • Checking the national screening register for screening history (eligibility). 	<ul style="list-style-type: none"> • Satellite broadband • “Hot-spotting” from cell phone data when possible. Even cell phone network coverage was unavailable in this location, so screening history sometimes relied on self-report.
Visibility and identification of the bus by the shearers and public	<ul style="list-style-type: none"> • Public unaware what bus was, why it was there and the service it offered. 	<ul style="list-style-type: none"> • Widespread advertising on social media pre-event • Media involvement before event • Signs/posters at the event.
Weather—heat, rain, wind	<ul style="list-style-type: none"> • Difficulty with tent for POC testing. 	<ul style="list-style-type: none"> • A space (such as a tent) protected from the outside environment to complete registration details and the informed consent process.
Dust being blown from the shearing shed	<ul style="list-style-type: none"> • Potential contamination of lab equipment . 	<ul style="list-style-type: none"> • Laboratory surface areas and equipment were wiped with a 10% bleach solution regularly and between patients.
Privacy	<ul style="list-style-type: none"> • Bus was fully utilised for clinical care, meaning that another space was needed for explaining the services offered, the research and taking medical history. 	<ul style="list-style-type: none"> • A separate and private space for consultations before the HPV test and to fully explain in advance the next steps if high-risk HPV is detected.
Enabling immediate colposcopy	<ul style="list-style-type: none"> • Lack of knowledge and awareness of what colposcopy was and why it was needed • Looking after children. 	<ul style="list-style-type: none"> • Supporting people choosing to have colposcopy on the day means supporting their whanau too: <ul style="list-style-type: none"> • Provision of childcare during the colposcopy appointment • A relaxing, whānau-friendly area for recovery • Offering refreshments after the colposcopy.
Separate space needed for POC testing	<ul style="list-style-type: none"> • POC testing was not built into the bus design. 	<ul style="list-style-type: none"> • Incorporating and building in POC testing space on bus.

woman's health bus and, if cost-effective, expanding the mobile service to other rural community events throughout Aotearoa New Zealand.

Conclusion

Despite multiple challenges, successful collaboration between community charitable event planners, a local rural NGO, a research team and clinicians running a mobile gynaecology bus enabled provision of POC HPV testing and

colposcopy for 2 days of a community event. This service was found to be acceptable to rural transient workers in a high-income country. Women want to look after their health. The bus removed barriers to cervical screening such as appointments, travel and being enrolled in primary care. However, it is critical to be flexible to each community's needs. One model will not fit all and if we want to achieve the WHO goal of eliminating cervical cancer we need to adapt to the needs of each community.

Figure 1: The mobile bus and POC testing tent.



COMPETING INTERESTS

Cepheid loaned the GeneXpert® machine but had no part in the conceptualisation, study design, protocol development, project administration or findings of the study. The study was funded by the Health Research Council of New Zealand (HRC 20/550).

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