

Multi-methods process evaluation of the SToP (See, Treat, Prevent) trial: a cluster randomised, stepped wedge trial to support healthy skin



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Summary

Background Healthy skin is important for maintaining overall physical and cultural health and wellbeing. However, remote-living Australian Aboriginal children contend with disproportionately high rates of *Streptococcus pyogenes* (Strep A) infected impetigo. The SToP Trial was a large stepped-wedge cluster randomised trial of See, Treat, and Prevent (SToP) skin health activities implemented between 2019 and 2022 in the Kimberley region of Western Australia, during which a decrease in impetigo was observed. We aim to evaluate the implementation of the SToP Trial activities and understand the relationship between the trial methodologies and outcomes observed.

Methods A trial evaluation framework was developed, with the aim to assess whether the SToP activities were implemented as intended, and to gain insights into the implementation and practice necessary to translate this project more broadly. The evaluation employed a multi-methods approach, drawing on both quantitative (metadata relating to type and frequency of project activities, survey results) and qualitative (interview and yarning) data. The evaluation aimed to assess the delivery of the program in terms of implementation, degree of impact, and context.

Findings Nine Kimberley communities participated in the SToP Trial between September 2018 and November 2022. During visits at the end of Steps 1 and 2 (October 2021 and October 2022, respectively), 152 people including 46 community members, 69 school staff members, 29 clinic staff members and 8 other service providers participated in a combination of individual and group interviews/yarns. Findings indicate the SToP Trial and associated activities existed and were completed within a culturally complex context with competing health and socioeconomic priorities while retaining specificity to each involved community. Acceptance and uptake of community activities was high, reflected in a marked decrease in skin infection during the Trial period. Trial activities including increased skin surveillance, staff training, availability of study treatment, environmental health initiatives and health promotion could not individually be linked to this improvement in skin health.

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Interpretation The leadership and guidance of community leaders, families, and regional Kimberley partners contributed to the Trial succeeding in its intended delivery of activities. Similar projects should prioritise a co-designed community-wide, holistic approach to health issues.

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Keywords: Indigenous health; Skin health; Randomised controlled trial; *Streptococcus pyogenes*; Remote health; Impetigo; Scabies

Research in context

Evidence before this study

Healthy skin is important for maintaining overall physical and cultural health and wellbeing. However, remote-living Australian Aboriginal children contend with disproportionately high rates of Strep A infected skin sores. Strep A infections have been epidemiologically linked to serious health complications such as acute rheumatic fever and rheumatic heart disease (RHD). Unfortunately, Australian Aboriginal children living in remote Northern Australia have some of the highest reported rates of skin sores and RHD in the world.

Added value of this study

This process evaluation of the SToP Trial indicates activities were most successful when they retained specificity to each

involved community while prioritising the leadership and guidance of stakeholders and community leaders.

Implications of all the available evidence

As the largest randomised control trial on healthy skin and rheumatic fever prevention in geographically remote Australian settings, this project offers important learnings for researchers who aim to make a difference in the health outcomes of remote-living Indigenous peoples. Co-design at all stages of Trial development and execution must be prioritised.

Introduction

Indigenous children in colonised nations experience high rates of health disparities linked to historical trauma resulting from displacement and dispossession, as well as ongoing systemic racism.¹ Skin infections and their complications are one such health inequity, with some of the highest global burdens described in remote-living Aboriginal children in Australia.² In particular, untreated impetigo infections (caused by *Streptococcus pyogenes* [Strep A] and/or *Staphylococcus aureus*) may lead to long term complications such as renal failure (following post-streptococcal glomerulonephritis) and rheumatic heart disease (following rheumatic fever).³

Observational studies over two decades have shown that Aboriginal children living in remote communities in Australia have a 45% median prevalence of impetigo, the highest burden of impetigo worldwide.⁴ In the Kimberley region of Western Australia (WA), Aboriginal children are 15 times more likely to be admitted to hospital with a skin infection than their non-Aboriginal peers.⁵ A situational analysis of skin health in the Kimberley, conducted with and for Kimberley stakeholders in 2017, aimed to understand and inform skin health initiatives for the region moving forward.⁶ The analysis found that while skin infections were common in the Kimberley, services in the region were committed

to working together to reduce this burden, with a specific focus on addressing environmental factors and the social determinants of health.⁷

Between 2018 and 2023, researchers, Kimberley Aboriginal service providers and communities partnered to co-develop and implement a large comprehensive skin control program focused on Seeing, Treating, and Preventing skin infections in the region.⁸ This project, the SToP Trial, saw the delivery of a combination of improved skin infection identification and treatment training, provision of evidence-based treatment in a ‘treatment as prevention framework’⁹; and environmental health and health promotion activities, with the aim to reduce impetigo by 50% for children aged 5–9 years old living in nine participating communities. The trial featured a stepped-wedge cluster randomised design with a focus on Prevention – these features were prioritised by Kimberley partners to ensure access for all participants to study activities, and a focus on the environmental and social factors.

Key findings from the SToP Trial, reported in detail elsewhere,¹⁰ showed that 38% of 5–9 years old had impetigo at the beginning of the Trial,¹⁰ consistent with the burden established in previous reports.¹¹ Impetigo in 5–9 year olds displayed a strong secular downward trend over the course of the trial, with modelled declines

of 17–19% across clusters. However, the biggest drop was observed during the baseline period of the trial where the only Trial activity underway were skin checks assessing prevalence of skin infections and prior to the commencement of See, Treat, and Prevent interventional activities (herein referred to as Trial activities given the negative connotations the word ‘intervention’ has in Australian Aboriginal and Torres Strait Islander contexts as a result of past failures of policy). Scabies prevalence at baseline was lower than expected based on previous studies.^{12,13} While modelling revealed a small decline after commencement of the Trial activities, these low baseline numbers restricted the power to draw conclusions on the cause. These factors, in conjunction with a disruption to the project timeline due to COVID-19 travel restrictions, resulted in limited evidence to attribute the decline in impetigo and only moderate evidence to attribute the decline in scabies to the activities of the SToP Trial.

Recognising the complex context in which this trial was conducted and the previously described challenges in evaluating randomised trials of health initiatives,¹⁴ a trial evaluation framework was developed (Table 1)⁸ with the aim to assess whether the SToP activities were implemented as intended, and to gain insights into the implementation and practice changes necessary to translate and scale up this approach.

Methods

The SToP Trial protocol has been published⁸ with further detail in the report of study findings.¹⁰ In brief, the project was conducted in the 421,000 km² Kimberley region of WA, home to approximately 35,000 people, 47% of whom identify as Aboriginal. Following consultation with the Kimberley Aboriginal Health Planning Forum (KAHPF) Research Subcommittee and community leaders, nine remote communities (>90% Aboriginal occupants) partnered to participate in the project, which was a pragmatic, open-cohort, stepped-wedge cluster randomised trial conducted from 2018 to

2023. This trial design was chosen in keeping with community preferences for all to receive the opportunity to participate in study activities by the end of the trial.

The nine Kimberley communities were divided into four clusters based on advice from local Aboriginal and non-Aboriginal health and environmental health service leaders from the Kimberley Aboriginal Health Planning Forum and the following pragmatic criteria: a combined population of approximately 1000 people, access to a health clinic staffed at all times by nurses and accessibility for research staff.⁸ Community clusters were randomised to begin SToP Trial activities at one of two timepoints during the trial (Step 1 or Step 2). Within participating communities, children aged 0–18 years were recruited by staff members from a local Aboriginal Community Controlled Organisation (ACCO),¹⁵ to participate. The intervention (Trial activities) involved See, Treat, and Prevent activities carried out in the school, clinic, and community settings (Fig. 1). All communities had a single school, clinic, and store providing services for the community. This feature of these remote communities ensures equitable access to the Trial activities.

A pre-specified evaluation framework was developed for the trial⁸ using program theory¹⁶ (Supplementary Table S1). Based on this model, five evaluation domains were identified (Table 1) to assess the impact of SToP activities on recognition (See), treatment (Treat) and incidence (Prevent) of skin sores and scabies, as they pertain to the project’s objective to reduce the burden of skin conditions in children aged 5–9 years of age.

Semi-structured interview and yarning data from the beginning (baseline period 2019–2020) of the trial was previously evaluated and published as a formative analysis of the skin health knowledge and context in SToP Trial communities.¹⁷ Interview and yarning data reported in the evaluation was collected at ends of Step 1 and Step 2 once communities had participated in the SToP Trial activities. Through triangulation of this with a range of pre-specified data sources, the

| Evaluation Domain | Research Question | Data Source |
|--|---|---|
| Efficiency | ‘To what extent were recognition, treatment, and prevention activities adopted?’ | Activity delivery metadata; semi-structured interview and yarning data |
| Fidelity, performance, and acceptability | What was the acceptability and uptake (coverage) of the activities? What were the barriers and enablers? What were the factors that had success at changing seeing, treating, or preventing behaviours? | Training acceptability surveys; semi-structured interview and yarning data; skin health medication prescription data extracted from clinics |
| Effectiveness | To what extent did the activities improve skin health awareness/alter behaviour? | Skin health presentation data extracted from clinics; semi-structured interview and yarning data |
| Impact and relevance | Did the activities result in a change in skin health? | Quantitative primary and secondary trial outcomes (reported elsewhere) ¹⁰ ; semi-structured interview and yarning data |
| Sustainability | Which activities were maintained during the maintenance and evaluation phase of the trial? | Skin health presentation and medication prescription data extracted from clinics; semi-structured interview and yarning data |

Table 1: SToP Trial evaluation domains.

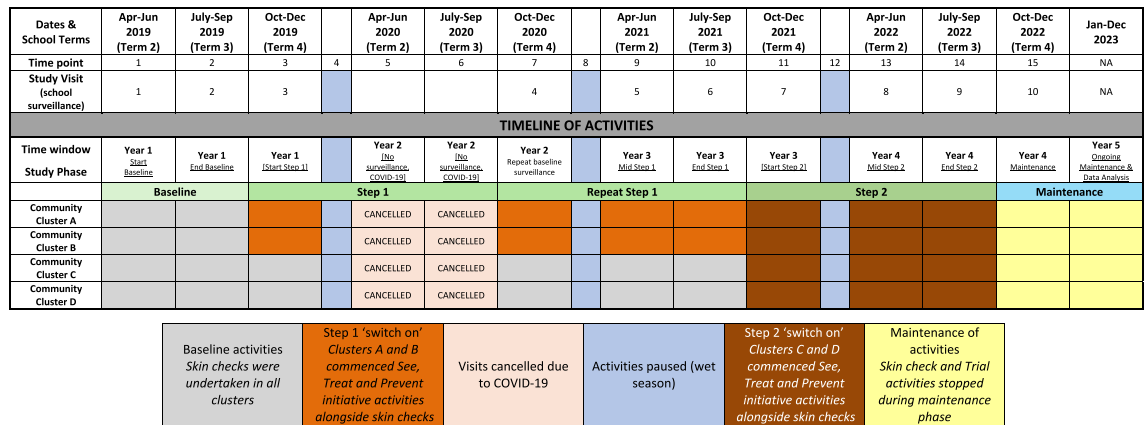


Fig. 1: See, Treat and Prevent activity delivery details and intended timeline – that was disrupted due to the global COVID-19 pandemic (2020–2023).

evaluation aimed to assess whether implementation was delivered as intended and provide insights into the practice changes necessary to translate this trial more broadly.

Community members and service providers within participating communities were eligible to participate in yarning and/or semi-structured interviews during the trial, either individually or as groups based on preference. Purposive sampling was employed to recruit school and clinic staff and community members, whereby potential participants were actively selected to take part.¹⁸ To recruit community members exponential snowballing methods were used,¹⁹ whereby Aboriginal participants introduced SToP Trial staff members to family members and/or community members who they believed might be interested in taking part. Snowball sampling is a widely employed method of sampling in qualitative research that can enrich sampling populations when other recruiting options have been exhausted.²⁰ In this study evaluation, snowball sampling provided a culturally appropriate method to connect with community members through the relationships already established between researchers and participants. Informed, written consent was provided by all participating in yarning activities.

The research team were advised at the commencement of the Trial that collecting demographic data or capturing participant characteristics had the potential to identify individuals, which was not desired. Therefore, for yarns, participants were asked to self-identify as either a community member or a service provider.

The multi methods evaluation of the trial drew on quantitative and qualitative data collected throughout the study. Primary data comprised a) training feedback surveys to assess acceptability of training (school and clinic, collected at end of training sessions whenever possible/appropriate), b) knowledge, attitudes and practices surveys completed by service providers, collected at baseline,

end of Steps 1 and 2, c) semi-structured interviews with service providers (school, clinic, council, pool), at end of Steps 1 and 2, d) yarning sessions with community members, collected throughout the trial in line with community timelines, e) presentation and medication prescription data extracted from the electronic medical record systems of participating community clinics,¹⁰ and f) metadata relating to project activity delivery, as captured in project staff records.

Semi-structured interviews and yarning sessions were conducted face-to-face by Aboriginal and non-Aboriginal SToP Trial research staff with prior interviewing experience, and cultural training and support from staff of the Kulunga Aboriginal Unit at Telethon Kids Institute.¹⁷ Emphasis was placed on building relationships and establishing rapport as a key aspect of yarning methodology and was integrated into the consent to participate. Yarning circle participant numbers were determined by the community members present.

Training acceptability surveys were an optional activity for participants receiving training and collected non-identifiable data only. As such, consent was implied through survey completion, as approved by the relevant ethics committees.

Statistics

Interview and yarning transcripts and notes were managed and analysed using NVIVO QSR International Pty Ltd. Version 12 software package (2022).²¹ A combination of deductive and inductive thematic data analysis²² and line-by-line coding was independently conducted by 2 research staff (IAD and TM). A coding tree was developed to elucidate categories, and categories collapsed into themes. To ensure rigour, preliminary themes were independently identified, and refined collaboratively until the final themes and sub-themes were established. A third research staff member (MM) checked the coding of transcripts to the

themes and contributed additional interpretation regarding coding development and emergent findings.

Training acceptability surveys were collected in hard copy and/or online through REDCap,²³ depending on participant preference. Hard copies were then entered into the REDCap database by study staff. Simple descriptive statistics at cluster level and figures were generated using R, version 4.2.1 or above (R Core Team 2022) and Stan (Stan Development Team 2022).

Ethics

The SToP Trial Partnership Steering Group with members inclusive of all four partnering organisations - Telethon Kids Institute, Kimberley Aboriginal Medical Service, WA Country Health Service, Nirrumbuk Environmental Health and Services – granted approval for the study and provided Aboriginal governance and guidance to data sovereignty throughout the Trial. Following support from the KAHPF Research Subcommittee (2017-018), ethical approval was granted by the health ethics review committees at the Child and Adolescent Health Service (RGS0000000584) and the WA Aboriginal Health Ethics Committee (Ref819). Approval was also provided by the University of WA (RA/4/20/4123), Catholic Education WA (RP2017/57) and WA Department of Education (D18/0281633). Reciprocal support was provided from University of Notre Dame (Reference: 2021-128F) and Murdoch University (2022/196). Participants were provided with an information sheet and consent form prior to interviews and yarns, and if informed consent was provided, interviews and yarning sessions were audio recorded using a handheld Olympus audio recorder, transcribed verbatim, and de-identified. Some participants did not wish to be audio recorded, and these contributions were instead recorded by a scribe who was not participating in the yarn/interview. Where possible, notes and transcriptions were offered back to participants to check and confirm for accurate reflection.

Role of the funding source

The study funders had no role in study design, data collection, analysis, interpretation, or writing of the report.

Results

Nine Kimberley communities participated in the SToP Trial between 19th September 2018 and 22nd November 2022. During visits at the end of Steps 1 and 2 (October 2021 and October 2022, respectively), 152 people inclusive of 46 community members, 69 school staff members, 29 clinic staff members and 8 other service providers participated in a mixture of individual and group interviews/yarns. Of these, 29/46 (63%), 60/69 (87%), 27/29 (93%) and 8/8 (100%) individuals respectively provided consent to record, resulting in

90/152 (59%; 75 individual and 15 group) yarning sessions recorded and transcribed; whilst 62/152 (41%) were captured by note-taking. Surveys to assess the acceptability of training activities were completed by 133/245 (54.3%) of school and 96/155 (61.9%) of clinic staff. The primary reason for non-completed training acceptability surveys was a lack of time.

Efficiency

To what extent were recognition, treatment, and prevention activities adopted?

See, Treat, and Prevent activities were carried out in line with the protocol as much as was practical, considering the impact of COVID-19 on the trial timeline (Fig. 2).

See activities. 915 children were consented to participate in skin checks, which were conducted in each cluster from the beginning of the trial. Over ten visits, 777 (85%) children collectively participated in 3084 skin checks with 138 children having no skin checks due to family movements, boarding school enrolment, school attendance rates <70% and other reasons. This activity began in the baseline period of the trial and was not a specified Trial activity, however any children identified to have a skin infection were referred to the local clinic via a letter to parents (delivery facilitated by school staff) and a list of children with skin infections provided to the local clinic staff. Both community members and service providers described the skin checks positively.

“... it’s really nice when you guys come out and you do your own checks. And obviously, we really trust how you check skins. You all know what you’re doing. And then when - we have actually found a lot of children with each check come into the clinic, and I would think it’s a really good - been a good reminder for us in the past year without a school nurse that there are kids running around with these really bad skin conditions that we aren’t picking up. So yeah, it’s been really great just having that confirmation that oh, we actually really - like what you guys are doing is really making a big difference. And I think it encourages us to keep our eye out for it as well.” C031 (clinic staff member).

Skin infection recognition (See) training was offered for school staff at each study visit for each community cluster, commencing from the time when that cluster entered their Trial activity period (variably Step 1 or Step 2). There was variation in uptake of training opportunities between clusters (Fig. 2), with 15 of 20 intended training sessions completed. Across the clusters, a total of 245 school staff members completed training during the trial.

Treat activities. Skin infection treatment Treat training for school and clinic staff was also offered at all study visits once a cluster entered its Trial activity phase. In response to the impacts of COVID-19 on clinic staffing,

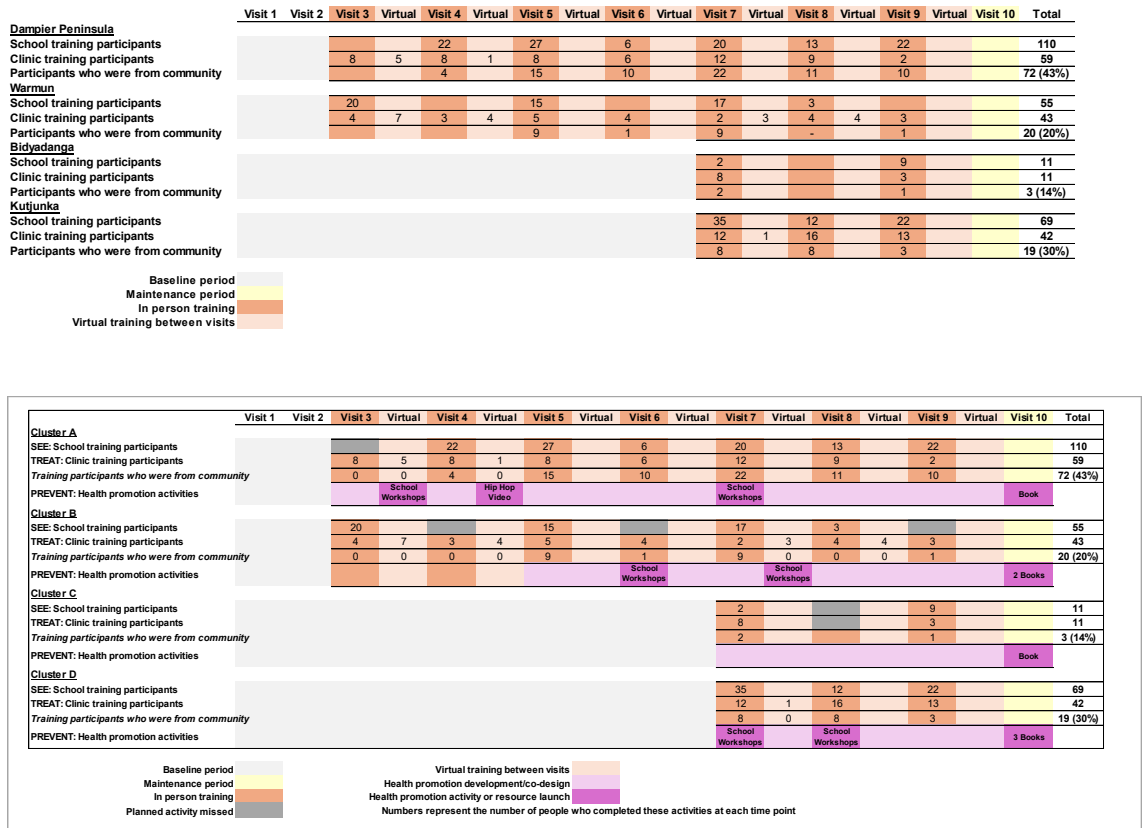


Fig. 2: Frequency and degree of SToP Trial activities completed.

from 2020 onwards virtual training was also offered between study visits for new staff upon clinic request. Only one of 20 (5%) planned training sessions was missed throughout the trial, with seven additional virtual sessions completed. In total across the four clusters, 155 clinic staff members participated in training.

Prevent activities. We have previously published learnings from yarning with SToP Trial communities during the baseline phase of the trial (2019), which informed the co-development of health promotion resources during the remainder of the project.¹⁷ In brief, communities recommended the development of educational resources in local languages, with a focus on embedding culture, storytelling mechanisms and traditional medicines alongside biomedical treatment procedures to prioritise cultural security for Aboriginal people.

During the trial, one hip hop video and seven books were co-developed with participating communities, incorporating local languages, artwork, and traditional knowledge. In addition, healthy skin workshops for children were co-designed with Aboriginal Teaching Assistants from two clusters and delivered in six of the

eight (75%) participating schools. All clusters participated in the co-design of at least one health promotion resource. While the original intent was to align the timing of this work with the timeline of the See and Treat activities, this process ultimately took place on different timelines in each community cluster as guided by community members, councils, and governing bodies. All resources were launched within their respective community clusters by trial end, although some continued to undergo further adaptation and dissemination during the maintenance phase. Learning from the unique context of each community, a case-study approach to individual evaluation of each health promotion resource has been adopted – an evaluation of the hip hop video development has been reported²⁴ and to date, has had over 5000 views on YouTube. The evaluation of other resources will be reported separately. As demonstrated by the below quote, the use of local language in each of the books was valued highly by participants.

“So using them in language and culture and bringing them back into the classroom that way. So that’s part of keeping healthy and keeping strong. And bringing that into our

culture lessons too. So we have our health lessons, and then (Name) can be using it in the health, and it can be used - integrated through other subjects, which I think's really good." S052 (school staff member).

Environmental health was raised by many participants (both service providers and community members) as an important factor to consider not only for skin health but also for other areas of health (eyes, ears). This echoes the sentiment of Kimberley leaders throughout design and implementation of the trial that support for environmental health services will be crucial for success.

Clinician 1 [about clinical treatment for scabies] *"We are just band aiding the top of it whereas the environmental health is the biggest thing."*

Clinician 2: *"Environmental is the base."* Group C007 (clinic staff members).

Access to functional health hardware and behaviour required to sustain healthy skin will also prevent other infectious diseases, e.g., trachoma, otitis media with overall health and education benefits. Additional service providers focusing on other diseases were mentioned in interviews as also contributing to environmental health activities.

"The environmental health people have come through. The last time they were here they come through with the Trachoma Testing Team and they went to all the houses ... Environmental health went round with them to each house giving out towels and soap." Group C005 (clinic staff members).

Kimberley service providers have already established an exemplary set of Aboriginal-led services, and the sentiments of participants in this trial further highlighted the importance of that work. The notability of this factor cannot be understated, and given this, an extensive sub-analysis of environmental health findings will be reported separately.

Fidelity, performance, and acceptability

What was the acceptability and uptake of the activities?

What were the barriers and enablers? What were the factors that had success at changing seeing, treating, or preventing behaviours?

See activities. See training in schools was generally well received from surveys, with most rating the overall training either good (21%) or excellent (79%, [Supplementary Table S2](#)). There were, however, some participants who believed that the recognition of skin infections by school staff was onerous and out of scope for their already large workload.

"I think the education that's been handed over in terms of the professional development for staff has been really, really fantastic for us. And even though it might be repetitive, we

continue to do it every year because we get something new out of it every time we hear it, yeah. Definitely." S050 (school staff member).

"I think also is my teachers are here to teach. And we are educators. Now, we support the care of our kids. Of course, we want to make sure our kids are well and healthy. But our primary job is as an educator. So, to take one of my teachers away from education into something that they're not trained into, I don't think is beneficial to anybody." S048 (school staff member).

Treat activities. Training acceptability among surveyed clinical staff was high, with 29% and 70% rating the training session as good or excellent respectively.

"And I definitely appreciated the bits of education you would do in the mornings. And the first time you did it was all very new to me. It's not - like I said, it's not something we get taught and we come out here. And I wasn't very familiar with it prior to being out here." C031 (clinic staff member).

The STOP Trial Treat training delivered to clinic staff encouraged the use of sulfamethoxazole-trimethoprim (an oral antibiotic) over Benzathine benzylpenicillin (BPG, a needle) for the treatment of skin sores, and the use of ivermectin (a tablet) over permethrin (a cream) for the treatment of scabies. Some clinical staff described a change in their prescribing behaviour as a result of the training activities.

"Definitely. I think it's had an impact in terms of practice, particularly for skin sores. As I said, I don't have much personal experience with the scabies side of things and particularly with the practice of giving Septrin [sulfamethoxazole-trimethoprim] as an alternative to benzathine benzylpenicillin. So definitely it's influenced my practice and I know I've talked to other people about it. I said, "Let's try this instead of LAB." It's definitely had an influence and I think that endures today. I would most definitely consider Septrin before I consider benzathine benzylpenicillin." C032 (clinic staff member).

Clinical staff described the benefits and tolerance of oral sulfamethoxazole-trimethoprim over other treatments, and therefore more likely to encourage families/children to come to the clinic for treatment. They also discussed its effectiveness in treating *S. aureus* as well as *S. pyogenes*. However, they did raise concerns about the difficulty in ensuring that a full course (3 days) is completed, and whether this new practice could generate antimicrobial resistance to sulfamethoxazole-trimethoprim.

"Some of them, they won't take their antibiotics and complete it. I mean some kids, I have noticed and even I have experienced it, once you have taken it and they get better,

they think that they don't need to finish the course." HP014 (community and clinic staff member).

While some individuals reported changes in clinical decision making, data extracted from the electronic medical records of participating clinics did not demonstrate greater use of the SToP Trial treatments overall when compared to the 'business as usual' alternatives in most SToP Trial clinics (Fig. 3, Fig. 4). Overall, clusters A and B adopted more sulfamethoxazole-trimethoprim than clusters C and D.

This lack of prioritisation of SToP Trial treatment may reflect a combination of factors, including the effect of concerns previously discussed around the development of antimicrobial resistance, and the important factor of patient/parental choice in clinical decision making. Indeed, participants described a mixture of family preferences regarding medication some articulating preferences for the oral antibiotic because children feared 'the needle', whilst others preferring the injection due to the challenges of transporting and

administering the oral antibiotic, especially as some children did not enjoy the taste.

"We don't have fridges, or they have lots of kids in there ... so the kids think it [Septtrin] is a drink or take a drink out of it. The security of it and keeping it cold in the fridge. A huge factor is just compliance. Most people have got a few kids to try and remember to get them to take it all, once, twice or three to four times a day is quite major. Whereas an L-A Bicillin [BPG] one off done and then we've got the long acting." C023 (clinic staff member).

Low adherence to SToP trial treatment approaches may also be a factor of high clinical staff turnover, which was raised by several participants within the clinic and more broadly in the community, leading to low retention of individuals trained in the SToP Trial protocols over time.

"We are all agency (nurses). So, I'll go in a couple of weeks, someone will come in who's not been – you know, like, the

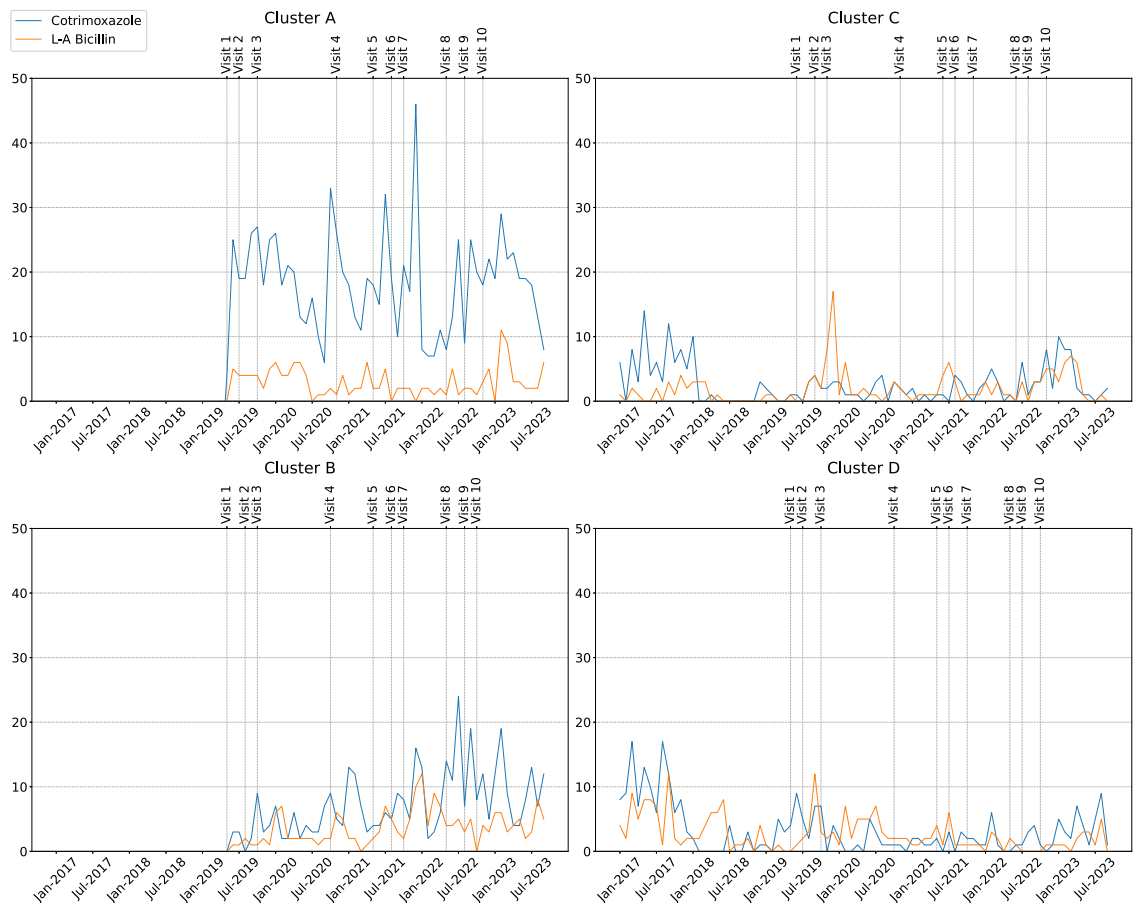


Fig. 3: Frequency of sulfamethoxazole-trimethoprim and benzathine benzylpenicillin intramuscular injection prescription for the treatment of skin sores.

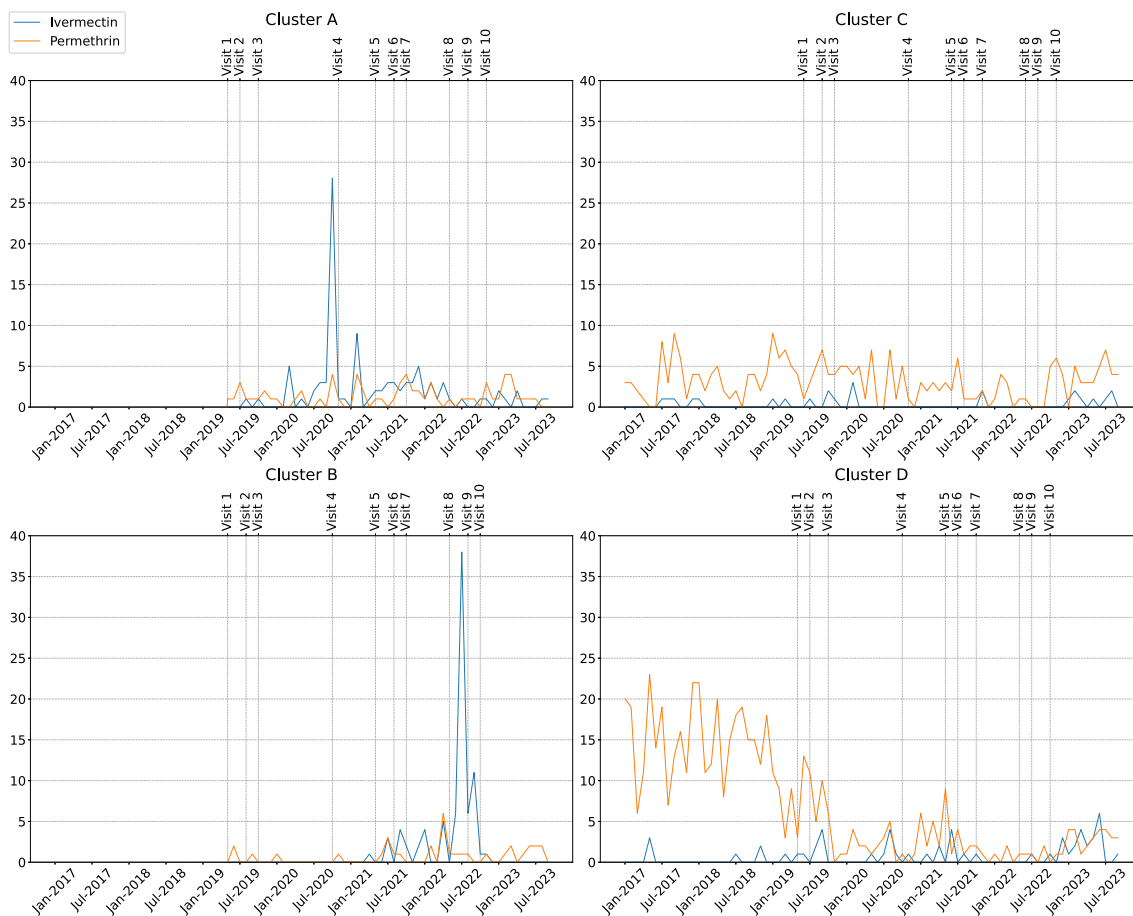


Fig. 4: Frequency of ivermectin and permethrin prescription for the treatment of scabies.

continuity is not good at all.” Group C009 (clinic staff member).

“I don’t really go clinic much. I don’t know, I can’t talk for everybody, but I’ve been told that they have a lot of turnovers in staff.” HP041 (community member).

“The only thing that I would say is that I think - because of the higher turnover of staff in the clinic, that I’m not sure that the way you are promoting - so the needle is always just used. It’s kind of first port of call, like they just always revert back to that.” S049 (school staff member).

Prevent activities. Throughout 2021–2022, co-design of visual healthy skin resources in local language was completed with the involvement of 85 community members across nine communities. These resources addressed a health promotion gap identified by community members who felt that currently available resources lacked relevance to target communities. It was recognised that uptake and acceptability of these resources was primarily a result of time taken to listen to

the needs of community members, establish relationships and embark upon a partnership.

“... you’ve really taken the time to understand and see the kids first-hand and also make resources that work out here, I guess. Like I said, the pictures that you used are very accurate, they show indigenous skin. You made resources in the local language. All those things are really appreciated, and I think they will make a big difference, which is good” C031 (clinic staff member).

Highly attended community barbeques were held in five communities during 2022 and 2023 to launch the respective books in partnership with ACCO Nurrumbuk Environmental Health and Services. For each book, copies were distributed to all families with the support of the schools and involved community members and placed in each classroom as well as the school library (if applicable).

Some communities elected to include descriptions of and uses for bush medicine as treatments for skin

infections as a way of enhancing uptake of the resource and increasing ownership. As one community member said about their healthy skin book;

“I wasn’t expecting it to look this flash. But everything is just there, you know. Not only, because I tell people, ‘Don’t put too much word. You’ve got to put pictures too.’ It’s really good. You got words but you got a lot of pictures too, so people can thing, read it. Some people don’t know how to read. But yeah, it’s easy to understand I reckon. Plus we got our language in there. So people, the schools can learn them kids more about the language as well. So when we’re talking to them out bush when we’re doing all our bush medicine thing and when we’re talking to them about which plant or tree to get for the bush medicine, our kids will know. Our future generation.” HP041 (community member).

Effectiveness

To what extent did the activities improve skin health awareness/alter behaviour?

Skin health awareness. Some participants from the school, clinic and community described an increased awareness of the importance of skin health because of SToP Trial activities.

“I think what it’s done is be able to highlight the importance of healthy skin and be able to notice what’s going on for kids’ skin. Teachers do refer kids onto the school health nurse if their skin is showing signs of deteriorating or having boils and those sorts of things, and kids will also come into the front office and self-refer too. They’ll want to treat their skin as well.” S075 (school staff member).

“... especially the kids now know about sores and – yeah, like I was just at the school yesterday and the kids had all the little SToP stickers on their t-shirts and stuff. So yeah, I think the message is really kind of driven home, especially given the incidence of RHD. I think maybe a lot of them know how important it is to make sure that they don’t let those skin sores go untreated, so.” C034 (clinic staff member).

“I think more people are aware of it now. A lot of people, yeah. And probably the kids too, and the younger - the older kids like the upper primary kids, do you do them as well, yeah. I think they’ll be more aware of their sores now because they tell their parents, ‘I’ve got this sore, can you have a look at it for me.’” HP035 (community member).

This is consistent with indications from the analysis of baseline interviews previously reported,¹⁷ which found that community members had a strong knowledge of recognition, treatment, and prevention of skin infections at the beginning of the project but that this strength of knowledge did not extend to the role that skin infections play in contributing to RHD or kidney failure. In interviews carried out after the Trial activities,

there remained mixed opinions about whether communities broadly understood this link between skin and overall health, indicating that this may still be an area for improvement.

“I didn’t realise how bad it was, and it’s really important for the sore now. Before I’d just see a sore and we’d just bathe it and give it a salty water or something and much thought didn’t go into it. And now that I know how bad it is for rheumatic hey. And it being rheumatic if it doesn’t get taken care of.” HP035 (community member).

Altered behaviour. As reported in the primary analysis for the SToP Trial¹⁰ a marked increase in presentations to the clinic for skin conditions was noted in all clusters immediately following the beginning of the SToP Trial, and this was sustained throughout the project (Fig. 5).

Some participants suggested that increased awareness may have led children and families to attend the clinic more, and often this increased awareness was attributed to regular skin checks and resulting referrals, although these were not intended as a Trial activity in the design of the trial (having taken place during the baseline period).

“But it is great because the kids also know that if they have a skin sore and you guys aren’t around, they will walk to the clinic or even ask one of the teachers, and the teachers say, ‘Yeah, you better go to the clinic.’” S046 (school staff member).

While perceived by most as useful, the SToP Trial process of referring participants with skin infections to the clinic with the aid of school staff was also identified as an added task that frequently required extra work to complete. Some schools reported doing extra bus runs and follow-up to ensure letters were received by families, while their delivery could be forgotten by those with competing duties and responsibilities.

“But I feel like there still then becomes a bit of a gap if you guys leave your referral notes and then they sit on the office desk for forever.” S051 (school staff member).

Impact and relevance

Did the activities result in a change in skin health?

The prevalence of impetigo and scabies declined during the trial,¹⁰ however we were not able to statistically attribute this decline to the SToP Trial activities as the most marked decrease took place during the baseline period. There were varied opinions shared about the state of skin by the end of the trial, with most (particularly clinic staff) noting improvements, while some described a need to continue prioritising skin health.

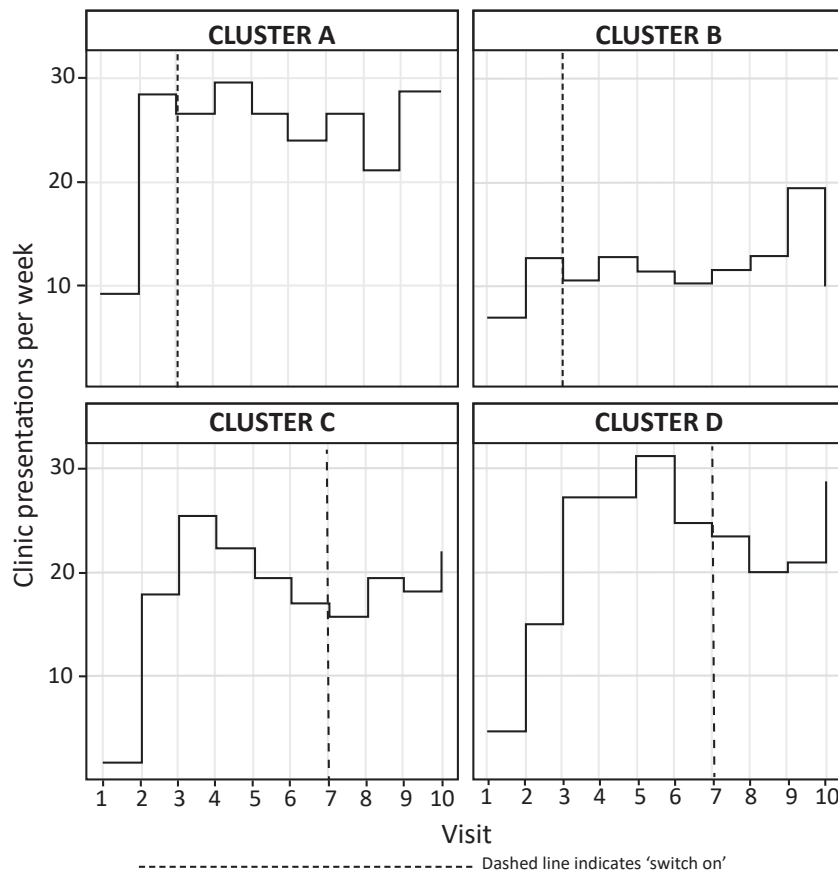


Fig. 5: Observed skin-related clinic presentations per week (all ages).

“And I’ve noticed actually even just in the last visit you guys – I don’t know if it’s because of the numbers you’re seeing, but there’s been way less referrals than – like I remember a few years ago, it would be two pages of referrals, and then it was a page, and half page, and I think yesterday was two kids, so yeah, we can see right from there that there’s an impact.” C034 (clinic staff member).

While the greatest decline in skin infections took place during the baseline period, the lower rates observed were sustained for the remainder of the trial. This may have been contributed to by the relevance of surveillance and training activities and in a context where community led health promotion activities had not yet been designed or implemented. Of the school and clinic staff who completed both training and training acceptability surveys, 88% of school and 82% of clinic staff noted the training flipchart would be useful when making decisions about skin ([Supplementary Table S2](#)). The relevance and accuracy of presented images of skin infections in the flipchart provided to schools and clinics was raised by many as important.

“I find a lot of the pictures used in that are very accurate to what we actually see out here. A lot of the time, education materials, they just don’t depict what we see out here, whereas yours, I’m like, ‘Okay, that actually really looks like what we’re seeing.’” C031 (clinic staff member).

Some participants also discussed that the reduction of skin infections may have been an impact of COVID-19, specifically the greater emphasis on hygiene and provision of resources such as soap and alcohol hand-gel into community by service providers. While the below quote reflects a clinician’s experience, school staff reflected that there was a greater inclusion of hygiene behaviour and messaging being practiced in the classroom both by students independently (i.e., coughing into elbows) and as part of the structured day (i.e., daily hand and face washing as a class).

“I think it is more prevalent that kids are [washing hands] post COVID. The hand sanitisers and washing hands. We had some presentations as well from Clinic where they put on the UV light and showed how important washing hands

and looking after your hands are important because of germs that may still habit on the skin even after washing hands.” S042 (school staff member).

Specifically, with Treat and Prevent activities, the applicability of ‘two way’ practice incorporating both biomedical practice and local culture was essential to sustaining the relevance of the Trial in involved communities. Bush medicines were shared with Trial staff by community members as alternate treatment methods for skin sores and incorporated into health promotion resources. Several community clinics facilitated the use of bush medicine in treatment, with a pharmacist in one cluster formalising a bush medicine program with local Elders and making them available for clinic patients. Ultimately, great emphasis was placed on the need for ‘both’ methods.

“I reckon with us in the remote communities, that that’s real dangerous for our kids to have that because we have a lot of kids now getting rheumatic heart because of skin sores. And it is real important that we work both ways, Gardia [non-Indigenous person] way and our way, Aboriginal way. And try stopping it.” HP041 (community member).

Sustainability

Which activities were maintained during the maintenance and evaluation phase of the trial?

In reflecting on the trial, participants made many recommendations for maintaining skin health support into the future. Commonly voiced priorities included the importance of continued skin checks within the communities, as most participants attributed positive changes to skin health during this phase of the trial. It was emphasised that any continuation of skin checks needed to go together with continuing healthy skin education.

“It’s really good, and we really need this to keep – you know, Telethon to keep coming and checking on our kids because most of the time we don’t have this, sometimes parents don’t take their kids to the clinic to get them checked, and this is the only time they can talk to the mob – like skin sores and all that. It’s really good that this program is happening, and they’re coming in and doing this, it’s really good.” HP033 (community member).

“I feel like with it finishing, once you guys don’t return to do skin checks, no one’s going to follow that up. It’s going to stop – kids are going to recognise they have a skin sore, or it’s a sore of some sort and maybe they’re not 100% sure of which one it is, but then them actually following it up themselves or their families following it up, it just won’t happen. So, that process will kind of dissolve unless we take it on as a school or you get the school nurse coming in regularly that actually follows that up.” S051 (school staff member).

The trial design included training for local community members with the aim of building capacity within communities for sustained skin infection recognition and action. The proportion of training participants who identified as local community members ranged between 14% and 43% across the trial clusters (Fig. 2). While there are clear strengths to this approach, when discussing the future, some community members discussed a preference for assistance from ‘outside’ or ‘professional’ teams, i.e., a continuation of the Trial model.

“I think it would be better if somebody come from outside. Because we got people on the ground who talk to people on a day-to-day thing, but maybe once a thing, like I’m saying, every three months if somebody like you guys from outside can come in. And not only for keep refreshing, but to keep friendship. And that trust, you know? People will get to trust you mob and have the relationship and everything. Trust them, get to know your mob.” HP041 (community member).

“And so, just having you guys also coming from there, that’s an external place, and your part - you know, you’re well-recognised. Everyone knows you here and they feel comfortable with you. So, I think it all helps, you know? And whereas I might say they need to go to the clinic because of this and they ignore me, you’ll say, ‘We’re doing skin checks and we’ve seen this,’ and they’ll go, ‘Oh, skin check people. Yeah, they’ve told us to go,’ so yeah.” S048 (school staff member).

Many discussed the benefits of a school nurse, either in the context of having or not having one, and if more consistent provision for this role could be a future strategy to firm up a sustained skin health strategy with integrated capacity for rapid treatment.

“There should be a nurse probably at the school beforehand to identify it [skin sore] or refer. You know, to parents say, “you need to take this child to the clinic.” GroupHP004 (community member).

“You would have a school nurse at school that would be able to see the kids regularly, have that connection with community or have a local teacher that goes with them to see the family, to do home visits, to then go “You need to do this. You need to take your kid to the clinic.” And then they actually have that capacity to then take the family to the clinic to help that – bridge the connection there.” S051 (school staff member).

Discussion

Achieving improvements in skin health in remote Australia was possible despite decades of high rates of impetigo demonstrated by a modelled decline in impetigo prevalence among children aged 5–9 years of

between 17 and 19%. It is clear that this outcome was due to the trimodal approach and could not be attributed solely to individual Trial activities.¹⁰ Our evaluation confirms that SToP Trial activities were implemented as intended with effectiveness, fidelity and sustainability.

The trimodal approach of See, Treat, and Prevent in combination had the intended impact, rather than individual components. This confirms the benefit of supplementing biomedical interventions with broad, community-involved and co-designed activities. This was further complemented by the inclusion of all audiences (school, clinic, and community respectively) in a manner specific to their normal day-to-day activities and capitalising upon current practices and ways of working. Trial activities were co-dependent. For example, the evaluation identified that behaviour change in the community - explicitly uptake of preferred treatments - could only occur once the clinical staff themselves had accepted and adopted the preferred treatments, however community requests following education could also drive this. Ultimately sustainability of SToP Trial activities required and will continue to require behaviour change at the school, clinic and community level. Whilst community members remain relatively constant, turnover of school and clinical staff is high; for example a recent study estimated workforce turnover in remote WA and Northern Territory clinics to be 151% annually.²⁵ The community members working as Aboriginal Health Practitioners (AHPs) and Aboriginal Teaching Assistants (ATAs) were less transient, embedded in the community and strong proponents of the trimodal approach to healthy skin. Growing this workforce with training and capacity-building of the next generation of health care workers and teachers is needed for sustainable change, and investment in these areas will yield benefit for outcomes beyond skin health.

In interviews and yarns, frequent references were made to teams visiting community to complete clinical activities and health promotion for trachoma treatment and prevention, and similarities between their practices and those of the SToP Trial. There was no way of measuring the quantity, type or effectiveness of other services and their respective activities on the primary outcome of the Trial beyond anecdotal discussions emerging from yarning. With several points made throughout yarns to analogous ways of working between the SToP Trial and 'trachoma mob', there may be merit for future health-based initiatives to combine activities as opposed to working with a singular focus.

Assessment of fidelity, performance and acceptability revealed that the key practice change for clinic staff was to implement evidence-based prescribing with fewer side effects and equivalent or better efficacy. Despite education and observational reports that more prescribing of these options was occurring, clinic data did not support this change. Changing a longstanding practice, despite the knowledge that it works, has been

more difficult and is a challenge not unique to the SToP Trial.²⁶

The results of the formative evaluation of the SToP Trial to assess effectiveness noted high rates of skin infections in remote Kimberley communities, perceived by some as a consequence of their normalisation.¹⁷ At the conclusion of the Trial, it is demonstrated that entrenched and longstanding perspectives can be negated through a combination of concerted efforts to raise awareness of skin infection consequences, treatment and prevention education and relevant and appropriate health promotion resourcing. However, many expressed it was difficult to maintain a focus on healthy skin without the external program and many advocated for investments in environmental health to achieve overall health including skin health.

As a research study funded and managed by staff external to involved communities, the model did not promote local community ownership of the activities. Instead, it was an external programmatic response, driven by priorities identified by local health champions, with education of staff, students, and community members as the key activity to drive local ownership. Perhaps surprisingly, and counter to perceptions of community-driven sustainability as a goal, the involvement of a non-local expert team visiting thrice annually to check skin was appreciated, seen as a strength, and supported by community members to continue indefinitely. This supports the need for partnership models with external investment of resources, time, and content-expertise to work alongside local champions. Expecting sustainability from communities themselves to maintain attention to the complex array of their own community health needs without this partnership is not sustainable. Community members expressed a preference for skin checks and activities to be conducted regularly by external providers, at a variety of locations including the school. The role of the school health nurses in supporting healthy skin for school aged children was valued across all community clusters, however at many schools visited, the position was unfilled temporarily due to staff shortages. Community members highly valued this role for easy access to health assessments; and school staff valued it to support their ability to prioritise teaching and learning while providing a more efficient connection between identification and treatment. In communities where a school health nurse was available, there were clear benefits to their presence, especially in facilitating treatment of students identified at school to be unwell in some way. This role could alleviate some strain expressed by teachers during training sessions, specifically that expecting them to carry on the recognition of skin infections for students could be too onerous on top of their existing workload. Staff retention, policies that enable school health nurses and funding are barriers to the sustainability of the school health nurse activities

needed for overall health improvements of children in remote Australia. Examples of opportunities for research to highlight the importance of this role including combining skin checks with seasonal influenza immunisations provided concurrently by the research staff and school health nurses as an example in several SToP trial communities.

The SToP Trial was purposefully designed in partnership with local healthcare providers for sustainability to wholistically address skin infections across the region. The partnership model strengthened implementation, however due to the impact of the COVID-19 pandemic on all healthcare delivery, sustainability is not guaranteed as other competing and unpredicted priorities emerged. To address this, all resources developed have been transferred to local healthcare providers for ongoing activities, and pleasingly, these have been adopted in some communities. Similarly, 400 clinic and school staff were trained over the course of the trial with sustainability in mind.

The SToP Trial focused primarily on the diagnosis, treatment and prevention of impetigo, and to prevent downstream consequences of acute rheumatic fever, rheumatic heart disease and acute post-streptococcal glomerulonephritis. However, the evaluation identified that community knowledge about the links between these needed ongoing support and strengthening, so that skin sores were not ignored as a recurrent, nuisance problem. The evaluation was strengthened by a robust dataset with a significant number of interviews and yarns recorded and transcribed over an extended period. Evaluation methods were hampered by the effects of the COVID-19 pandemic on continuity and completion against pre-established plans, but ultimately as the Trial was extended, provided greater opportunities for evaluation activities to be completed. Further, evaluation of the trial was limited to data collected within the implementation timeline, limiting the capacity to comment on the sustained impact of the trial on skin health after the end of the implementation phase (2022). Most importantly, the ability to adequately evaluate the suite of Trial activities was hindered by the need to complete skin checks across all clusters – including during the baseline period – to appropriately measure the level of Trial effect. This unintendedly acted as an intervention instead of simply a data collection strategy and is a consideration in design phase should similar stepped-wedged designs be completed elsewhere. Lastly, there is little way of accurately identifying if the observed change in behaviour and associated reduction in skin infection rates was a result of an unascertainable Hawthorne effect. Other studied factors e.g., clinic treatment changes also do not support this. Our evaluation indicates high participation in Trial activities is more likely.

Our evaluation demonstrates the SToP Trial and associated activities existed and were completed within a complex context while retaining specificity to each

involved community. Acceptance and uptake of community activities was high, reflective in a marked decrease in skin infection during the Trial period. Trial success can be attributed to the leadership and guidance of original community leaders, families, and regional Kimberley partners; and similar projects should prioritise a co-designed community-wide, holistic approach to health issues.

Contributors

HMMT: Data curation, Formal Analysis, Investigation, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MM: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing. SLE: Investigation, Project administration, Validation, Writing – original draft, Writing – review & editing. TM: Funding acquisition, Investigation, Project administration, Validation, Writing – original draft, Writing – review & editing. IAD: Data curation, Formal Analysis, Investigation, Writing – review & editing. JRC: Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing. JC: Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing. RC: Conceptualization, Funding acquisition, Methodology, Writing – review & editing. RF: Investigation, Project administration, Writing – review & editing. JJ: Methodology, Project administration, Resources, Supervision, Writing – review & editing. MJ: Formal Analysis, Resources, Software, Validation, Visualization, Writing – review & editing. JM: Formal Analysis, Validation, Writing – review & editing. KM: Supervision, Supervision, Writing – review & editing. VO: Conceptualization, Funding acquisition, Methodology, Writing – review & editing. EP: Formal analysis, Validation, Writing – review and editing. GP: Conceptualization, Funding acquisition, Supervision, Writing – review and editing. SS: Project administration, Resources, Supervision, Writing – review & editing. BS: Conceptualization, Project administration, Resources, Writing – review & editing. TS: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Supervision, Validation, Visualization, Writing – review & editing. AS: Conceptualization, Funding acquisition, Methodology, Writing – review & editing. SYCT: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Validation, Visualization, Writing – review & editing. RW: Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing. AW: Investigation, Methodology, Project administration, Resources, Supervision, Writing – review & editing. KW: Conceptualization, Funding acquisition, Methodology, Project administration, Writing – review & editing. EW: Conceptualization, Funding acquisition, Writing – review & editing. ACB: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. All authors had full access to all the data in the study, if they wanted to access it, and had final responsibility for the decision to submit for publication. Data was viewed and verified by ACB, MJ, JM, EP, HMMT and SLE. All authors read and approved the final version of the manuscript.

Data sharing statement

The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available.

Declaration of interests

All authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.eclim.2024.102793>.

References

- Phillips-Beck W, Sinclair S, Campbell R, et al. Early-life origins of disparities in chronic diseases among Indigenous youth: pathways to recovering health disparities from intergenerational trauma. *J Dev Orig Health Dis.* 2019;10(1):115–122.
- Thomas HMM, Enkel S, McRae T, et al. Skin health in northern Australia. *Microbiol Aust.* 2022;43(3):98–103.
- May PJ, Bowen AC, Carapetis JR. The inequitable burden of Group A streptococcal diseases in Indigenous Australians. *Med J Aust.* 2016;205(5):201–203.
- Bowen AC, Mahe A, Hay RJ, et al. The global epidemiology of impetigo: a systematic review of the population prevalence of impetigo and pyoderma. *PLoS One.* 2015;10(8):e0136789.
- Abdalla T, Hendrickx D, Fathima P, et al. Hospital admissions for skin infections among Western Australian children and adolescents from 1996 to 2012. *PLoS One.* 2017;12(11):e0188803.
- McLoughlin F, O'Donnell V, Bowen AC. Skin health situational analysis to inform skin disease control programs for the Kimberley. *Med J Aust.* 2022;217(1):58.
- Mc Loughlin F, Mullane M, Pavlos R, et al. *Skin Health Situational Analysis to inform skin disease control programs for the Kimberley.* Perth: Telethon Kids Institute; 2021. <https://www.telethonkids.org.au/projects/skin-health-situational-analysis-outcomes/>. Accessed June 24, 2024.
- Mullane MJ, Barnett TC, Cannon JW, et al. SToP (See, Treat, Prevent) skin sores and scabies trial: study protocol for a cluster randomised, stepped-wedge trial for skin disease control in remote Western Australia. *BMJ Open.* 2019;9(9):e030635.
- Montaner JS. Treatment as prevention—a double hat-trick. *Lancet.* 2011;378(9787):208–209.
- Thomas HMM, Barnett TC, Carapetis JR, et al. *SToP (See, Treat, and Prevent) activities for skin disease control in remote Western Australia: a cluster randomised, stepped wedge Trial* Under review. 2024.
- Bowen AC, Tong SYC, Andrews RM, et al. Short-course oral cotrimoxazole versus intramuscular benzathine benzylpenicillin for impetigo in a highly endemic region: an open-label, randomised, controlled, non-inferiority trial. *Lancet.* 2014;384:2132–2140.
- Andrews RM, Kearns T, Connors C, et al. A regional initiative to reduce skin infections amongst aboriginal children living in remote communities of the Northern Territory, Australia. *PLoS Negl Trop Dis.* 2009;3(11):e554.
- Carapetis JR, Connors C, Yarmirr D, Krause V, Currie BJ. Success of a scabies control program in an Australian Aboriginal community. *Pediatr Infect Dis J.* 1997;16(5):494–499.
- Sanson-Fisher RW, Bonevski B, Green LW, D'Este C. Limitations of the randomized controlled trial in evaluating population-based health interventions. *Am J Prev Med.* 2007;33(2):155–161.
- McRae T, Walker R, Jacky J, et al. Starting the SToP trial: lessons from a collaborative recruitment approach. *PLoS One.* 2022;17(11):e0273631.
- Markiewicz A, Patrick I. *Developing monitoring and evaluation frameworks.* Thousand Oaks, CA: SAGE Publications; 2016.
- McRae T, Leaversuch F, Sibosado S, et al. Culturally supported health promotion to See, Treat, Prevent (SToP) skin infections in Aboriginal children living in the Kimberley region of Western Australia: a qualitative analysis. *Lancet Reg Health West Pac.* 2023;35:100757.
- Campbell S, Greenwood M, Prior S, et al. Purposive sampling: complex or simple? Research case examples. *J Res Nurs.* 2020;25(8):652–661.
- Etikan I, Alkassim R, Abubakar S. Comparison of snowball sampling and sequential sampling technique. *Biom Biostat Int J.* 2016;3(1):55.
- Noy C. Sampling knowledge: the hermeneutics of snowball sampling in qualitative research. *Int J Soc Res Methodol.* 2008;11(4):327–344.
- QSR International. NVIVO. Melbourne: QSR International; 2022. <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/>. Accessed October 10, 2023.
- Azungah T. Qualitative research: deductive and inductive approaches to data analysis. *Qual Res J.* 2018;18(4):383–400.
- Harris PA, Taylor R, Thielke R, et al. A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* 2009;42(2):377–381.
- McRae T, Walker R, Enkel SL, et al. HipHop2SToP: empowering indigenous youth to address healthy skin and healthy living practices. *Front Public Health.* 2023;11:1258517.
- Veginadu P, Russell DJ, Zhao Y, et al. Patterns of health workforce turnover and retention in aboriginal community controlled health services in remote communities of the Northern Territory and Western Australia, 2017–2019 [pre-print]. *Res Square.* 2024. <https://doi.org/10.21203/rs.3.rs-4410278/v1>.
- Lawton J, Jenkins N, Darbyshire JL, et al. Challenges of maintaining research protocol fidelity in a clinical care setting: a qualitative study of the experiences and views of patients and staff participating in a randomized controlled trial. *Trials.* 2011;12:1–10.