



“You can’t heal yourself in that setting and you wouldn’t expect other people in this country to”: Yarning about housing and environmental health in remote Aboriginal communities of Western Australia

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ABSTRACT

Remote Aboriginal communities in Australia are located on traditional lands holding deep cultural significance and meaning for residents. However, systemic inequity rooted in colonisation has driven persistent housing and health disparities, with inadequate environmental health conditions within homes and communities a prominent example. Embedded within the SToP (See, Treat, Prevent) Skin Sores and Scabies Trial, which aimed to reduce skin infections in children aged 5–9 years by 50% across nine Kimberley communities, this qualitative sub-study sought to understand access to and perceptions of environmental health initiatives by yarning with those living and working in remote Aboriginal communities. Between 2019 and 2022, 208 people participated in individual or group yarning activities. Using a political economy of health lens, analysis of 137 yarning sessions revealed barriers to health, including infrequent services, inadequate housing, and entrenched challenges to achieving household maintenance. These obstacles stem from governance, procurement and logistics arrangements; a direct result of colonisation and land appropriation rather than individual behaviour. Addressing these barriers requires equitable standards in service provision, as well as clear decision rights over land and housing assets, procurement options enabling timely repairs, resourced local maintenance with guaranteed response times and sustained funding. Equity and reconciliation will only be achieved once structural barriers are removed.

1. Introduction

Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Aboriginal) people view health holistically, encompassing physical, social, emotional, and cultural well-being, as well as connection to Country, kinship, and community (Griffiths et al., 2016). Environmental health is central to this, addressing both built and natural environments (Lansbury Hall et al., 2020). However, access to effective environmental health initiatives for remote Aboriginal communities in Australia has been constrained by institutional bias, the continued effects of colonisation and long-term underinvestment (Wyber et al., 2020a; McRae et al., 2023; Ngaanyatjarra Health Service, 2024). Across Australia, environmental health practices include sanitation, animal control, food

hygiene, and garbage disposal; though, Aboriginal Community Controlled Organisations (ACCOs) in remote areas adopt a broader approach to environmental health (Haynes et al., 2022). This expanded focus—adding assessment of the home and its capacity to support health—acknowledges that colonisation and dispossession have produced enduring deficits in housing and maintenance that demand equitable action (Haynes et al., 2022; Clifford et al., 2015; Paradies, 2016).

Compared with non-Indigenous Australians, Aboriginal people are 2.3 times more likely to be hospitalised and 1.7 times more likely to die from environmentally linked diseases (Australian Indigenous Health-InfoNet, 2018), with illnesses such as acute rheumatic fever (ARF) and rheumatic heart disease (RHD) disproportionately affecting remote

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communities due to household crowding and poor infrastructure (Wyber et al., 2020a). Aboriginal teenagers face some of the world's highest rates of ARF and RHD; immune-mediated complications resulting from repeated and untreated *Streptococcus pyogenes* (Strep A) infections. As a result, they are up to 60 times more likely to die from RHD than non-Indigenous teens (Wyber et al., 2020a).

Primordial prevention of RHD addresses early determinants with an emphasis on building healthy communities and homes (Haynes et al., 2022). Both ARF and RHD can be prevented by interrupting the transmission of Strep A from person to person, which can cause superficial infections of the skin or throat (Lansbury et al., 2024). Strep A spreads more easily when people sleep within 1 m of one another (Barth et al., 2025), a common reality in crowded households. These post-infectious complications—once common among all Australian children—have largely disappeared among Australian-born, non-Indigenous children because of advances in environmental health, housing and healthcare services (Holmes and Rubbo, 1953).

Due to persistent barriers to achieving even the minimum standard of environmental health, Aboriginal people developed the Nine Healthy Living Practices (HLPs) in 1987 (Committee of Review on Environmental and Public Health within the Anangu and Pitjantjatjara Lands, 1987). The HLPs serve as a framework for addressing the environmental and housing needs of Aboriginal communities, with a focus on primordial prevention (Healthabitat, 2019). These practices respond to the deficiencies experienced by remote-living Aboriginal people, emphasising the need for both 'health hardware' (functioning showers and taps, access to a washing machine) and 'health software' (towels, soap, mattresses, linen, and blankets) within the home (Standen et al., 2020). Presented in Box 1, the HLPs are used widely to guide service providers working with Aboriginal communities to improve health (Standen et al., 2020).

Across the remote Kimberley region of Western Australia (WA), the HLPs inform how environmental health is achieved (Haynes et al., 2022). Kimberley Aboriginal leaders have led significant efforts to strengthen community health through household and community-level modifications. Specifically, the Aboriginal Environmental Health (AEH) Program, funded by the WA Department of Health, provides culturally appropriate services through ACCOs, including attending to some types of plumbing emergencies, health promotion, pest control, and safe bathroom assessments (Haynes et al., 2022). In collaboration with primary health care systems, ACCOs have also established the 'environmental health referral' system, enabling clinicians to submit a request to a local environmental health service provider if a patient or family presents to a clinic with an illness linked to environmental conditions (Environmental Health Subcommittee, 2017). With the consent of an occupant, AEH practitioners can assess the home, address defects where possible, and lodge requests for additional maintenance services. This referral system prioritises health hardware in the home by assessing its functionality and ability to support the HLPs (Haynes et al., 2022).

Environmentally attributable diseases in remote Australia are

exacerbated by limited access to tradespeople, delayed household repairs, distance and high infrastructure maintenance costs (Lansbury Hall et al., 2020). Some communities are hundreds of kilometres from the nearest town and accessible only by unsealed, corrugated roads that generate dust and reduce the integrity of transported health hardware. Flooding during the wet season (November to March) often renders these communities inaccessible (Western Australian Country Health Service, 2022). Remote communities also contend with a Federal Government policy of 99-year leases, which classifies 'permanent' residents as public housing tenants, an arrangement limiting residents' autonomy by forcing them to depend on housing providers for repairs (Mc Loughlin et al., 2021; Gock and Maloney, 2024). Repairs are provided by the State Government and typically managed by the Department of Communities under rental tenancy agreements (Mc Loughlin et al., 2021). Residents can report defects directly to the Department (Mc Loughlin et al., 2021), but timely responses are rare in remote areas, where maintenance visits are often grouped together to achieve economies of scale for the provider and scheduled only every 3–6 months, rather than a responsive system attending to maintenance issues as they occur. The AEH Program helps bridge these gaps by providing supplementary services in areas with limited infrastructure. However, AEH practitioners face restrictions on the types of repairs they can perform, further complicating timely solutions (Haynes et al., 2022).

These environmental and housing conditions sit within a longer Australian colonisation history of dispossession, mission and pastoral control, and later public-housing regimes that centralised asset ownership and decision-making away from Aboriginal people and communities (Griffiths et al., 2016). When home and land ownership is denied, families and communities are dependent on Governments for housing, which prevents them being able to assert their rights. Dispossession from land and an inability to independently generate wealth in the way non-Aboriginal Australians can maintains poverty and cycles of dependency; not through any fault of Aboriginal communities but through the greed of Western society. These factors, together with chronic underinvestment and the costs of distance and the wet season, have produced persistent crowding and unreliable health hardware. We frame the study through a political economy of health (PEH) lens (Szreter and Woolcock, 2004) whereby the HLPs are treated as household capabilities created or constrained by governance, financing and procurement, and maintenance arrangements rather than by individual behaviour. This framing explains why clinical activity or hygiene education cannot compensate for slow repairs or unfit infrastructure and directs attention to practical levers such as decision rights, the scope and timeliness of repairs, and accountable local delivery.

Repeated evaluations have been conducted to appraise the remote AEH program and service provision in WA. These assessments have included gathering the viewpoints of clinical staff, service providers, and policymakers regarding environmental health services, housing and the referral process (Haynes et al., 2022; Environmental Health Subcommittee, 2017). The results of an independent evaluation of the AEH

Box 1

The Healthy Living Practices with safety being paramount to all (Healthabitat, 2019).

1. Washing people.
2. Washing clothes and bedding.
3. Removing wastewater safely.
4. Improving nutrition, the ability to store, prepare and cook food.
5. Reducing the negative impacts of crowding.
6. Reducing the negative effects of animals, insects, and vermin
7. Reducing the health impacts of dust.
8. Controlling the temperature of the living environment.
9. Reducing hazards that cause trauma

program were released in 2022 and while many important recommendations were made, the evaluation did not include the voices of local people or communities (Haynes et al., 2022). Embedding lived experience is therefore necessary to understand where referral and maintenance systems fail and how capability can be restored.

Our study aimed to provide an in-depth analysis of access to and perceptions of environmental health initiatives by yarning with community members participating in the SToP (See, Treat, Prevent) Skin Sores and Scabies Trial (Szreter and Woolcock, 2004).

2. Methods

2.1. Setting

The Kimberley region of WA (Fig. 1) covers an expansive 423,517 km² in the state's north and is home to approximately 35,000 residents (Australian Bureau of Statistics, 2021), with Aboriginal people comprising 41 % of the population. The region consists of six major towns, about 100 Aboriginal communities of varying sizes, and many cattle stations (Western Australian Country Health Service, 2022). According to the 2012–2015 Kimberley Aboriginal Primary Health Plan (Kimberley Aboriginal Health Planning Forum, 2012), many remote communities of the Kimberley fall within the lowest socioeconomic quartile of Aboriginal populations nationwide (Kimberley Aboriginal Health Planning Forum, 2012). This is influenced by several factors, including an underestimation of the Aboriginal population (with some areas experiencing undercounts of up to 24 % (Kimberley Aboriginal Health Planning Forum, 2014)), ongoing colonial impacts, and the high costs of service provision due to the region's remoteness (Department of Primary Industries and Regional Development, 2017).

2.2. Co-design and positionality of the research team

Formally, the co-design approach of the SToP Trial and associated investigation included ongoing engagement with the SToP Partnership Steering Group—a mix of Aboriginal and non-Aboriginal representatives from key organisations, with Aboriginal leaders having overall decision-making priority to strengthen cultural governance—who met regularly to guide the research and ensure alignment with community priorities. The Prevention components of the Trial were entirely positioned by Aboriginal investigators, such that their perspectives, guidance and input were always central to shaping the research. Input was also sought

through yarning sessions with community members and service providers, which shaped the design, refinement and implementation of research tools and methods. Community connections were built with the aid of cultural navigators. Through this approach, engaging and developing a relationship with one person facilitated the development of relationships with others. All non-Indigenous team members completed cultural safety training through The Kids Research Institute Australia's Aboriginal unit and undertook on-Country inductions where able. We embedded reflexive practice via team debriefs and constant reflection with Aboriginal mentors, ensuring that research activities reflected local priorities, perspectives, and knowledge systems (McRae et al., 2023; Thomas et al., 2024a). Guided by mentoring, emphasis was placed on relationship-building and reciprocity over task completion. Time was spent on Country with Elders and in community art centres to listen and learn, and project timelines and expectations were adjusted to privilege trust, two-way learning and community priorities.

For this piece, most of the authorship team are based in Boorloo (Perth), working in partnership with Aboriginal colleagues and community-controlled organisations in the Kimberley. Most investigators including the lead author are non-Indigenous and of settler origin, receiving significant guidance from Aboriginal colleagues, cultural mentors, and advisors across design, data collection, interpretation, and authorship. Aboriginal co-authors CC and LB were critical to the conduct of this work and interpretation of results.

2.3. The SToP trial and evaluation

The SToP Trial launched in 2019 with the goal of reducing skin infections in children aged 5–9 years by 50 % across nine remote Kimberley communities. A stepped-wedge cluster randomised trial design ensured equitable access to Trial activities with a phased delivery of initiatives. Key activities included improving skin infection identification and treatment, training school and health staff, implementing treatment-as-prevention strategies, and integrating environmental and public health promotion efforts (Mullane et al., 2019). A fundamental aspect of the Trial was its commitment to Community Participatory Action Research (CPAR)—an approach ensuring research is conducted with and for communities, rather than on them (Baum et al., 2006). By positioning communities as equal partners, CPAR strengthened local decision-making and ensured that study activities, reflections, and outcomes were meaningful and relevant (Minkler, 2005). Originally, staff were to visit each community three times per year over three years. However, due to COVID-19 and resulting community closures, the timeline was extended. In total, each community was visited ten times, with visits occurring in Terms 2, 3, and 4 of 2019, 2021, and 2022, as well as Term 4 of 2020 (Mullane et al., 2019). Trial outcomes (Thomas et al., 2024b) and the accompanying evaluation (Thomas et al., 2024a) have been published elsewhere.

A program theory-driven evaluation framework was applied to assess the impact of the SToP Trial, considering changes in the recognition, treatment, and prevalence of skin infections, as well as the effectiveness, acceptability, efficiency, and sustainability of Trial initiatives. Evaluation activities included yarning; a culturally appropriate qualitative methodology in Aboriginal communities that facilitates storytelling and two-way learning developed by Aboriginal researchers (Bessarab and Ng'andu, 2010). Yarning creates a culturally safe space for participants to share experiences on their own terms, and is more akin to a conversation than an interview (Bessarab and Ng'andu, 2010). Across the lifetime of the SToP Trial, yarning allowed for relationship-building among researchers and participants. Participants were recruited through purposive sampling, targeting school staff, clinic staff, and community members. This was further supported by exponential snowball sampling, allowing Aboriginal participants to introduce researchers to others in their networks, ensuring participation was driven by existing relationships and cultural protocols, rather than researcher-led recruitment (Thomas et al., 2024a). Following advice



Fig. 1. The Kimberley region of Western Australia (shaded in blue).

from community partners, detailed demographic data were not collected to protect participant anonymity. Instead, participants were asked to identify only as community members or service providers (e.g., school or clinic staff). Yarning sessions and semi-structured interviews were conducted face-to-face and in English, either individually or in groups, depending on participant preference. Sessions were held in locations chosen by participants to maximise comfort and accessibility. Participants were given an information sheet for reference and a consent form to sign, and consent was obtained before any recording. Olympus handheld recorders were used unless participants preferred not to be recorded; in which case a scribe took detailed notes. As per the evaluation framework, questions focused on skin health, service delivery, and community challenges (Thomas et al., 2024a). Environmental health themes often emerged organically. When feasible, participants were given the opportunity to review transcripts or notes to confirm their accuracy.

2.4. Data analysis

Interview recordings were transcribed verbatim and de-identified. Data were managed in NVivo QSR International Pty Ltd. Version 12 (2022) (QSR International, 2022). Initial coding was inductive and based upon the methods of Braun and Clarke (2006). Two research team members (TM and IAD) completed line-by-line coding, refined categories through discussion, and grouped these into broader themes; a third researcher (MM) reviewed the framework to support rigour. For this manuscript, the dataset was re-read through a political economy of health lens (Szreter and Woolcock, 2004) and themes were organised around ownership/authority, financing/procurement, labour/maintenance, and logistics (distance, wet season, freight), then mapped to household HLP capability. Given the Trial's focus on environmental health, a secondary analysis examined environmental health-specific data; this was led by SE, with preliminary interpretations discussed with a representative from a local Aboriginal environmental health service provider (CC) to ensure accuracy in interpretation. This approach grounded interpretation in the data while incorporating local and cultural knowledge and reflective discussion.

2.5. Ethics and governance

With support from the Kimberley Aboriginal Health Planning Forum Research Subcommittee (2017–018), ethical approval was granted by the ethics review committees at the Child and Adolescent Health Service (RGS000000584), University of Western Australia (RA/4/20/4123), Catholic Education Western Australia (RP2017/57), the Department of Education (D18/0281633) and the Western Australian Aboriginal Health Ethics Committee (819).

3. Results

At the conclusion of the SToP Trial, the primary outcome of a 50 % reduction of impetigo among children aged 5–9 years had been achieved (Thomas et al., 2024b). Regarding evaluation activities, between 2019 and 2022, 208 people participated in individual and group interviews/yarns, including 62 community members (29.8 %), 47 clinic staff (22.6 %), 91 school staff (43.8 %), and 8 other service providers (3.8 %; e.g., pool managers). Of these, 45/62 (72.6 %), 82/91 (90.1 %), 45/47 (93 %), and 8/8 (100 %) respectively consented to recording, resulting in 131/208 (65.9 %) sessions (116 individual, 21 group) being recorded and transcribed (Thomas et al., 2024a).

Thematic analysis revealed five household- and personal-level experiences, providing insight into the environmental health challenges faced by Aboriginal communities in the Kimberley. These findings contribute to a broader understanding of the systemic factors influencing skin health in remote settings and highlight the need for sustained community-driven initiatives. Results are interpreted through a

PEH lens: we describe system mechanisms (ownership, contracts, maintenance, logistics) by how they enable or limit households' ability to carry out the HLPs, rather than as matters of individual behaviour.

3.1. Beliefs and understanding about the impact of the environment and hygiene on people's health

Yarns revealed a strong understanding of the impact of environmental health on wellbeing among participants. In some communities, local champions spoke about identifying ill health caused by inadequate access to health hardware and software and worked to address it. These acts restore HLP capability temporarily but do not resolve systemic causes. A participant described fixing a washing machine to help others.

"It's just about helping one another you know, and especially I help with old people. And young mums who haven't got a washing machine, they come and ask if they can do washing. I only just tell them, 'Just buy washing detergent or Surf, and just bring your washing powder here and then bring your stuff and then I'll put it on for you.'" – Community member (HP028).

School staff, able to access more timely household maintenance through different pathways, were less aware of environmental health challenges faced by community members. Timely maintenance is demonstrably possible; procurement, contracting and access pathways privilege staff tenancies, systematically disadvantaging Aboriginal households. A teacher described a past school policy where children were not allowed at school unless they had showered.

".. like apparently, previous years the school had a policy of don't come to school unless they are showered. I have never heard of that. I was quite new when someone told me that. That is really, you know but it is something that we kind of spoke about that maybe we want to reintroduce without really a force. Because don't want kids staying at home if the plumbing is broken, because we have showers here. We can provide that here so I guess." – School staff member (S019).

3.2. Environmental health within the community

Community environmental health includes communal processes and infrastructure supporting the HLPs. Three communities had a local swimming pool (supporting HLP1) and community laundries (supporting HLP2), but their availability was limited by closures and staffing. These assets extend household capability when operations and maintenance are funded and governed locally, while interruptions reflect procurement, workforce and liability settings rather than individual choice.

"You know, one of the things that has happened in the last 12 to 14 months is the swimming pool was opened, and so, skin problems if anything become, I think, less of an issue. It is not necessarily because of that but that is just one of the things that may well helped. But yeah, less." – Clinic staff member (C017).

Participants noted health promotion programs were often delivered by environmental health providers and clinics, sometimes paired with the distribution of health-related supplies such as soap and washing powder. In one community, a local champion accessed funds to purchase a trailer full of cleaning supplies which was available to individual households to use alongside education from the clinic. There were also several mentions of activities, including rubbish collection and community clean-ups, where a drive was made on a certain day or week to 'tidy up' (HLP6 and HLP9).

Several challenges to community-level environmental health were discussed. Specifically, participants noted the prominence of 'hard water' in several communities, often not fit for drinking and resulted in calcified plumbing and health hardware.

“Good water, only for adults, not for babies. You have to boil it for babies and kids. And we have this problem, those drains, some are open.” – Community member (HP026).

Cold weather and stagnant waterholes were noted as further barriers to maintaining hygiene. Other challenges included the effects of pests and rubbish (HLP6) and an inadequate workforce to complete municipal duties (HLP9). In addition, while one community had a community laundromat (HLP2), its proximity to the shop was seen as a deterrent to use, with people unwilling to do their laundry in view of others.

3.3. Environmental health at an individual or household level

Discussions highlighted two major challenges to maintaining a healthy living environment: whether housing was appropriate for the number of occupants (HLP5) and access to timely and effective housing maintenance. Notably, although lodgings for school and clinic staff were managed separately from community housing, these residents were aware of community members’ experiences, sharing stories they had heard, reinforced through interviews with those living in community housing.

3.3.1. The challenge of housing appropriateness (crowding, access to health hardware)

Participants frequently highlighted that housing designs in remote communities fail to meet residents’ practical needs or preferences. One community member explained:

“For us in this remote community, it’s really hard. This housing you’ve got, it’s not really good. It’s not really a house, it’s just something like, it’s not built properly.” – Community member (HP031)

Despite environmental health referrals being an active process in all communities, clinicians emphasised that issues like a lack of functioning showers or hot water (HLP1) perpetuate recurring infections, particularly skin diseases. While attempts were made to act on environmental health referrals in a timely manner, long waits were common if demand was high or if the community was inaccessible during the wet season. In addition, service providers handling environmental health referrals are not funded to provide soft furnishings (i.e., towels, mattresses) and, in the Kimberley, sometimes organised charitable donations from hotels to meet the need. Access to personal health hardware, like washing machines, was also mentioned by some as being limited at a household level.

Importantly, several quotes within this theme made a distinction between crowded homes by choice (i.e., living with large families) and crowded homes by necessity, where there were not enough homes available in the community to house all residents appropriately. Several participants shared that one effect of the COVID-19 pandemic was the return of family members to Country from larger towns and cities, which placed extra pressure on home hardware (HLP5) (Haynes et al., 2022). Many emphasised that they never wanted to turn family away if they needed a place to stay, while others shared that family had moved in with them because their own home was no longer functional, and maintenance requests were not being acknowledged or completed. Heavy population growth in the community also meant that young families had no accommodation options of their own, as no new homes were being built, so they continued to live intergenerationally, with more generations added to the home. Anecdotally however, corporate homes available for teachers and nurses were often under-occupied, with four-bedroom houses frequently housing just one or two people, emphasising allocation and tenure settings as structural drivers of crowding.

“Some of my families are away in towns, we want them here.”

Interviewer: “So they’re forced to live off Country because their houses aren’t fixed?”

“Yeah, because their houses aren’t fixed and they go into town. But I don’t want to see my families like that, I want to see them here.” – Community member (HP027).

Lack of jobs, healthcare, and higher education compels community members to move between their communities and urban areas, adding fluctuating pressure to already crowded homes (Haynes et al., 2022).

3.3.2. The challenge of home maintenance (timeliness of repairs, access to contractors, quality of maintenance)

A frequently identified challenge in achieving high environmental health standards within the home was the difficulty of having contractors come to fix broken health hardware or provide home maintenance. Often it was easier to buy a new washing machine than repair a simple defect. This was partly due to both a lack of skilled tradespeople in the communities and the distance from hardware stores where supplies for washing machine repairs could be obtained. Many preferred buying new whitegoods over arranging repairs.

“You cannot get an electrician out here obviously. It is hard, you know, to just go and buy a new washing machine.” – Clinic staff member (C002).

Some community members spoke about relying on the health hardware of family members if their own was broken, such as washing their clothes in the washing machines of other homes (HLP2) or storing their food in a refrigerator (HLP4). It was common for community members to share that their washing machines had broken down, particularly after being overloaded with blankets. However, in communities without a functional laundromat or industrial washing machines, there was no alternative. The only recognised enabler of good environmental health in the home was a few references to the actions of one community council, which elected to use funds raised from corporate use of their airstrip to buy a large washing machine for each home—large enough to wash blankets.

“Yeah, so each household now has a brand-new washing machine that won’t shred your clothes. Big enough to clean a minky blanket [a large polyester blanket commonly sold in remote communities]. That was the spec, and not rip it up.” – Clinic staff member (C011).

3.3.3. Cost of goods

A further challenge was the cost of goods. Given the remote location of many communities, the price of goods in shops was inflated by freight and travel costs, restricting some locals from purchasing health software (i.e., soap, washing powder, towels) and limiting their choice of health hardware (i.e., fridges and washing machines—of which only one option might be available in the shop at any given time, if any). Electricity in several communities was provided by a card-operated meter system, whereby credit must be pre-purchased and loaded directly onto the power meter. Participants shared that these cards were expensive, but if not purchased or provided, they prevented the use of lights, air conditioning, fans, hot water, and home whitegoods. Power cards could only be bought when the store was open, and while credit could be monitored via a meter box, it may run out at any time, cutting off power supply—particularly if overcrowding or hot, humid conditions in the wet season increase air conditioning and fan use to cool the house (HLP8). From a PEH lens, these power card arrangements limit households’ ability to enact the HLPs.

3.4. Environmental health service provision intersecting with the contracted services for home maintenance

A range of different activities were discussed regarding environmental health service provision, such as handing out health software (i.e., towels, soap) to households or the clinic (HLP1), providing education to classes at the school, desexing dogs (HLP6), facilitating large-scale community clean-up programs—specifically prior to the cyclone

season (HLP9), and providing home repairs and maintenance. Health promotion was also described as being partnered with environmental health activities alongside clinic initiatives when a trend in high disease burden was identified. While many environmental health activities were described, more people yarned about the inefficiencies of service provision and the need for ongoing, frequent, high-quality access to tradespeople and contractors to support health within a home or community. Viewed through a PEH lens, the reliability of HLPs is primarily shaped by how services are governed, funded and maintained, rather than by individual behaviour.

3.4.1. Delayed process, difficulty with access and a need for 'more'

Requesting repairs was a convoluted process rarely producing timely results. If an environmental health referral was made by the clinic and actioned by an environmental health officer who was unable to complete the necessary repairs, an external tradesperson would have to be contacted by housing management. Delays in repairs were common, with many noting that a tradesperson would not make their way to a remote community to fix one tap; instead, several jobs needed to be lodged before a visit would be made, causing major delays in the work being performed. This contrasted with service provision in metropolitan areas, where well-established infrastructure and a higher concentration of skilled professionals allowed repairs to be completed relatively quickly with minimal delays. Additionally, the widespread availability of hardware stores meant that residents could easily purchase simple tools for household maintenance. Delays reflected contracts that prioritised batched visits, creating long periods where HLPs could not be achieved.

"I know anecdotally the stories, and people can share with you about, like waiting for months and months for the repairs." – School staff member (S045).

It was evident that even in some communities where environmental health service provision could be said to be functioning well, greater funding for environmental health services was required. There were several examples shared by participants in which environmental health service providers were operating outside their scope, simply because they visited most regularly and were poised at a particular moment to rectify an issue, with the alternative likely being a very long wait time for the work to be actioned by a contracted housing maintenance provider. Devolving authority and resources locally would improve capability.

"... maybe if we could have more money invested into environmental health and make them more accessible because at the moment I think they are understaffed and can't get out very often." – Clinic staff member (Group C002)

Additionally, it was noted that not only did funding constraints prevent adequate environmental health service provision, but household consent was required for amendments to a home to be made, and this was not always granted. Some highlighted that service provision might be underutilised within a community due to the 'shame' of having someone unknown entering a home. This went both ways, with clinic staff often concerned about offering an environmental health referral at the risk of 'accusing' people of having unfit homes or blaming them for their health condition. Reports of 'shame' reflect historical power imbalances and past experiences of compliance, highlighting the need for trusted community navigators.

3.4.2. Health provider perception

Local environmental health services were spoken of highly as providers, embedded in and/or known within the communities, and accessible to those who require their expertise. Nonetheless, procurement and maintenance contracts constrain what AEH practitioners can resolve in the absence of decision rights and budget limitations.

"So environmental health are very receptive. They want to do any work that they can and they really do want to help." – Clinic staff member (C011).

However, as expressed by several respondents, it was apparent that maintenance service providers or tradespeople often did not complete high-quality work, and many who discussed this were deeply disappointed by this. References within this theme pertained to providers 'just doing the bare minimum,' passing problems off to others as 'someone else's job,' being expensive, too siloed, and failing to communicate with tenants about when they would be attending to complete repairs, often meaning the requested maintenance was further delayed. The costs of tradespeople were also highlighted several times, with a major factor being travel costs, as contracted maintenance providers often travel from the cities—sometimes over 2000 km at high expense. This raises cost and lowers quality, undermining timely, durable repairs that local, accountable providers could deliver.

"Some of the repairs that are done by tradesmen are atrocious. They are broken by the time they have left the communities sort of thing. They just do patch up jobs." – Community member (HP010).

"Up until June last year, it has been \$825,000 repairing our houses, \$496,000 of that was travel." – Community member (HP010).

3.4.3. Community awareness of environmental health service provision

It was clear that the systems to be navigated were complicated, spanning multiple organisations and agencies. For the most part, respondents were aware of processes specific to their community, but this knowledge was unable to prevent delays. Overall, most people knew who to contact if there was an issue with their housing, with the Department of Communities being the most frequent response. However, many respondents noted that the contact process could be better explained to community members whom they thought might not be aware of it. A single reporting pathway and routine performance updates to communities would increase transparency and access.

"I think they could absolutely promote it a bit more. You know, just so they know. I am not even too sure myself. Like if someone came to ask me, I would need to ask around because I don't have clear person to call or chat with." – Community member (HP023).

3.4.4. Clinic engagement and referrals

As part of this sub-theme, the process for actioning an environmental health referral was described, elements that were working were identified, and suggestions for improvements were made.

"With environmental health, we can do referrals for environmental health if we find that these kids are getting repeat infections we can refer to an environmental health. They'll go and check out the houses and stuff like that with consent from the people who live there." – Clinic staff member (C045).

Several participants believed the current environmental health referral process was working, with some speaking highly of specific AEH practitioners who regularly engaged with the clinic or were quick to respond to requests for a housing assessment.

"[Environmental health ACCO] are fantastic, and they do their job and they really – if you put a referral in – I was dealing with them only a week ago, and they came out to the house and they definitely visited." – Clinic staff member (C031).

Not all clinic staff were aware of or used the referral process—likely due to high turnover (Veginadu et al., 2024) and limited training. Some noted that the process was unnecessarily prolonged by bureaucracy. A clinic staff member stated that more referrals could possibly be made, but poor household environmental health conditions had become normalised—meaning they were widely accepted as the usual state of

affairs, despite being unacceptable elsewhere. As a result, only the most extreme cases received attention. Such normalisation should be viewed as an adaptation to persistent shortfalls in service, rather than local preference or neglect.

“I think probably the hard thing is though, I think because all houses are probably almost on par with, they’re all probably not clean enough, let’s be honest. But I think because they’re all so similar, we kind of let it slide a bit more.” – Clinic staff member (C031).

A notable point raised was the need to close the feedback loop between household occupants, AEH practitioners, the clinic, and the community. It was apparent that clinic staff would have completed more environmental health referrals if they had received direct feedback each time one was made, including whether a home was accessed by providers, what defects were identified, and what amendments were made. However, this could conflict with household confidentiality and might not be necessary for clinic staff to know.

“Like I did say because it was an environmental health guy here and he came and spoke to me for ages and I said why don’t we get feedback from your mob when you do come and see people. You can’t just refer and not know what is happening. We should work together.” – Clinic staff member (Group C007).

Referrals translate clinical concern into a request but do not alter asset control, with outcomes still dependent on housing providers’ contracts and repair timeliness.

3.5. Social equity

Many respondents inferred that communities participating in the SToP Trial, as well as others in remote Australia, experienced a level of environmental health deprivation that would not be accepted in other regions. Those interviewed at the clinic discussed that treatment could only do so much, and infections would recur unless improvements were made to the home and community environment. Furthermore, inadequate housing and environmental health standards were identified as having a flow-on effect on other matters of social concern while being unable to adequately sustain clinical progress. There was an underlying theme of normalisation of conditions combined with fatigue from repeated, often unsuccessful, attempts to rectify the situation.

“Nothing will change. We are really not doing anything. We get them better but within two weeks they get worse again. It is constant infection because the environment is just not supporting good health.” – Clinic staff (Group C003).

The sentiment that inadequate environmental health across remote Aboriginal communities was, above all else, a failure of consecutive State and Federal policies over decades was frequently expressed.

“It is more down to the Government colonisation and housing. You can’t really do much if your living conditions don’t change and nothing ever gets put into housing. You can try your hardest to clean things and get treated but if the house has got twenty people in it and no air con you are not going to get anywhere. This is empirical knowledge right across Australia. That is where the problems lie ... It has always put on they choose to be like that rather than it is actually an imposed system that has been placed on them. You can’t heal yourself in that setting and you wouldn’t expect other people in this country to.” – Clinic staff member (C030).

The SToP Trial centred upon the skin health of children, and many participants spoke about their disappointment that these children were not privy to the benefits of living in a well-resourced, high-income nation like Australia. Decades of normalising sub-standard environmental health conditions within the home had created a habit of tolerance; a symptom of a settler-colonial policy lineage. As surmised by a clinic staff member regarding the process of actioning an environmental

health referral:

“I think we allow a lower standard to probably occur, and it’s only when things get really bad that we probably make those referrals.” – Clinic staff member (C031).

As emphasised by a local Elder

“You need to be healthy, kids need to be healthy. We don’t want them to get sick, they’re the future, the future of our communities.” – Community member (HP027).

Overall, equity was framed as an expectation of the same essential-service standards afforded to other Australians, so that children’s health is protected by homes that enable HLPs. Taken together, governance, procurement, maintenance and logistics interact to produce patterned periods when HLP capabilities cannot be enacted, despite clinical activity or health education. This explains recurrent skin infection risk as an effect of system design, not household choice, and identifies leverage points inclusive of contract scope, repair timeframes and local maintenance capacity amenable to policy reform.

4. Discussion

This study presents Aboriginal and other lived experiences, alongside informed perspectives from Kimberley communities, to highlight barriers to health and wellbeing. Read through a political economy of health lens, the immediate drivers of limited HLP capability are governance, procurement and maintenance arrangements rather than individual behaviour. Infrequent maintenance, unfit housing and slow repairs reflect contract settings (e.g., batched maintenance runs), tenure and liability arrangements, and logistics (distance, climate, freight) that shape exposure in the home. Although people described strong knowledge of environment–health links, households had little scope to change these conditions. By naming these mechanisms, the study points to practical chokepoints for reform: decision rights and home ownership, the scope and cadence of repairs, and resourcing for local capacity.

ACCO and Aboriginal Community Controlled Health Organisation (ACCHO) sectors have long lobbied for better remote housing, highlighting tensions between State and Federal Governments. The 2017 expiration of the Remote Housing Strategy left gaps in agreements between the Federal Government and States, sparking public disputes (Federal Financial Relations, 2019; National Indigenous Australians Agency, 2019). Aboriginal leaders criticised governments for politicising Aboriginal housing (Garrick, 2019). While agreements were eventually reached between the Northern Territory (NT) and WA, the recommendations of a 2017 review of Remote Housing, noting a need for a 50:50 split of the cost of any Aboriginal housing program to be shared by the Australian Government and jurisdictions, have yet to be realised (Department of the Prime Minister and Cabinet, 2019). In 2023, the largest commitment to housing in a generation passed through Federal Parliament (Albanese and Collins, 2023). Of the \$10 billion commitment to building 30,000 new homes nationwide, only \$200 million was earmarked for the repair, maintenance and improvement of housing in remote Aboriginal communities with no commitment to new builds in these regions (Albanese and Collins, 2023). Estimates provided in *The RHD Endgame Strategy* (2020) indicate a commitment of at least 5550 new dwellings in remote areas is required to reduce household crowding by 20–30 % by 2028 (Department of the Prime Minister and Cabinet, 2019), acknowledged as an underestimate for reasons including outdated census data and the strategy accounting only for households with three bedrooms (Wyber et al., 2020b).

A sentiment communicated by respondents was the failure to build homes that were designed in a way that reflects the wants and needs of local families and communities. Structural crowding is defined as a home not having enough space for the people who want to live there, a term acknowledging the social and emotional benefits associated with living within a large, often multigenerational household (Australian

Housing and Urban Research Institute, 2014). However remote homes are consistently built without community consultation that would incorporate an effective, health-focused response to structural crowding and are thus unfit for community use (Lansbury et al., 2024; Buergelt et al., 2017). As Fien and Charlesworth note, both cross-cultural and cross-disciplinary consultation must take place prior to infrastructure being erected in remote communities (Fien and Charlesworth, 2012). This is often ignored, as the tyranny of distance increases the time and cost of such consultation. Omitting community consultation may save costs initially but leads to unsuitable housing and considerable future expenses. Closing the Gap—a strategy aiming to improve the life outcomes of Aboriginal people is a formal commitment made by all Australian governments to achieve Aboriginal health equality (Closing the Gap, 2023a)—has specific targets regarding housing. Target 9a calls for an increase in the proportion of Aboriginal people living in appropriately sized (not overcrowded) housing to 88 % (Closing the Gap, 2023b), currently at 81.4 % (National Indigenous Australians Agency, 2022). As these statistics are national, it is noted that these are likely to be less promising if extrapolated to remote areas of the country; thus a stronger focus on these regions is needed.

Remote Aboriginal community members and service providers (including ACCOs) understand the health impacts of adverse environmental health conditions but negotiating effective and long-term outcomes through non-ACCO engagement is often challenging. Environmental health providers praised by participants operate under State funding constraints and uneven resource distribution; a review of the WA AEH Program servicing the Kimberley identified an urgent need for new financial resourcing (Haynes et al., 2022). The review also emphasised Aboriginal leadership and governance across the AEH Program, which can strengthen procurement settings for non-ACCO providers through quality assurance and mechanisms to hold trades to account. Alongside this, there is scope to expand local technical training and workforce capacity to reduce reliance on external contractors. Critically, training must be paired with decision rights, tools, parts budgets and guaranteed response timeframes via procurement reform, otherwise local workers will be trained into roles without the means to act. Embedding these roles within Aboriginal Community Controlled Organisations would align with community priorities and ensure local skills development contributes directly to sustained, culturally safe service delivery.

Several alternative modalities have been proposed to address HLP capabilities in remote Aboriginal communities; for example, including hand-operated washing machines that can operate without power.³ While trials in Alice Springs in 2018 indicated these to be acceptable, data are unpublished and it is unlikely that machines operating without power are able to reach the temperature required to kill bacteria, scabies mites and lice.³ Further, this manuscript is firm in the principle of equity in service provision; that Aboriginal communities should expect the same essential-service standards as other Australians. Hence, policy solutions should prioritise delivery and maintenance of HLP capabilities rather than substituting lower-quality technologies or shifting maintenance burdens to households.

The topics of environmental health and housing are often considered contentious for remote communities, with associated stigma preventing in-depth discussions. In our work we found that people were willing to share and discuss their experiences with us, but yarns with community members were generally shorter and less detailed than those with school and clinic staff. However, the data collated are substantial, and all themes are supported by community voice and quotes from local people.

5. Conclusions

This study stresses the enduring impact of systemic neglect on environmental health and housing in remote Aboriginal communities. Our findings point to system settings, not behaviour, as the main drivers of poor environmental health and recurrent skin infection risk.

Addressing these inequities requires immediate and coordinated action and service-equivalent standards, clear decision rights over housing assets; procurement that prioritises timely repairs rather than batched runs; locally based maintenance with guaranteed response times and transparent reporting; and sustained funding for new builds, maintenance, and remediation. Community-led housing design that tackles structural crowding and the realities of remoteness and climate is essential. Bridging these gaps is not only a matter of public health but also a fundamental step toward achieving equity and reconciliation. The culture and uniqueness of remote Aboriginal communities thrive despite challenges, but they should not have to contend with a situation that is non-existent elsewhere in Australia.

CRedit authorship contribution statement

Stephanie L. Enkel: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Chicky Clements:** Writing – original draft, Supervision. **Hannah M.M. Thomas:** Writing – review & editing, Validation, Supervision, Methodology, Investigation, Funding acquisition, Data curation. **Tracy McRae:** Writing – review & editing, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation. **Ingrid Amgarth-Duff:** Writing – review & editing, Visualization, Methodology, Investigation, Formal analysis, Data curation. **Marianne Mullane:** Writing – review & editing, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation. **Lisa Wiese:** Writing – original draft, Supervision. **Liam Bedford:** Writing – review & editing, Supervision. **Nina Lansbury:** Writing – review & editing, Supervision. **Jonathan R. Carapetis:** Writing – review & editing, Supervision. **Asha C. Bowen:** Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Statement of respect

Throughout this paper Aboriginal and Torres Strait Islander peoples are respectfully referred to as Aboriginal as this is the preferred terminology in Western Australia where this Trial was conducted. We recognise and acknowledge the diversity between Aboriginal and Torres Strait Islander cultures, and do not intend to diminish any identity. We respectfully acknowledge Aboriginal ownership of the land, waters and sky of Australia in continuity for more than 60,000 years.

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.

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Declaration of interests

All authors declare that they have no conflicts of interest.

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Data availability

The data that has been used is confidential.

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