

# Health services for Indigenous children in remote Australia: a strategic literature review

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## Research Article

**Keywords:** Aboriginal, Torres Strait Islanders, Health services, pediatric, rural and remote

**Posted Date:** April 3rd, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-386342/v1>

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# Abstract

**Introduction:** There is a significant gap between health outcomes in Indigenous and non-Indigenous children, which may relate to inequity in health service provision, particularly in remote areas. We aim to review the literature to describe health services and their use by children living in remote Australia, comparing them to best practice models to identify opportunities for improvements.

**Methods:** Electronic-databases of medical literature were searched from Jan 1990 to Dec 2013. Grey literature was identified through investigation of websites, including local, state and national health departments. Essential information was extracted and summarised for papers meeting inclusion criteria for the review.

**Results:** A total of 45 titles was identified in a strategic search of electronic medical databases and 47 in the grey literature. Strict inclusion and exclusion criteria applied. Data were extracted from 92 documents.

**Conclusions:** Barriers exist to effective child health service delivery in remote Australia including availability and access. Existing services cannot meet demand. Gold standard models for service delivery incorporating community engagement and collaboration should be explored. Increased resources and focus on primary prevention and health promotion are essential.

## Introduction

Indigenous peoples account for 3% of the 25 million Australian population (1, 2). Many (27%) Indigenous Australians live in remote and very remote settings where they comprise 45-90% of the population (1, 2). Indigenous children living in remote Australia experience a greater burden of disease than children living in metropolitan settings (3-9).

Indicators of child health and life expectancy include low birth weight (< 2500g) and infant mortality rate (10-13). In 2010, Australian Indigenous babies were twice as likely (12% birth prevalence) as non-Indigenous babies (6%) to have a low birth weight (LBW). Indigenous children have an infant mortality rate 1.8 times higher than non-Indigenous children (5.1 versus 2.9 infant deaths per 1000 live births, respectively) (14).

Hospitalisation rates are higher across all age groups of Indigenous compared to non-Indigenous Australians (11). Rates of hospitalisation and emergency department presentation for Indigenous children living in remote areas are high, often for potentially preventable skin, respiratory and gastrointestinal infections (8, 15, 16).

Social determinants contribute to Indigenous health inequality and include poor nutrition, housing shortage, limited primary health care access, and disadvantage in income and education (17).

Following the 2009 'Closing the Gap' strategy each Australian State and Territory developed plans and policies to address gaps between Indigenous and mainstream health indicators and improve the

effectiveness of health service delivery to children in remote settings (18, 19). For example, the Queensland State Government aims to close the health gaps by 2033 by addressing risk factors, increasing primary prevention strategies and access to multidisciplinary health services, and nurturing safe environments for children (4).

Indigenous children living in remote areas need priority access to high quality health care (20). This is a human rights issue with significant implications for chronic disease prevalence and life expectancy but this was not included within the scope of this review.

We aim to review the academic and grey literature to 1) describe existing services and their use by Indigenous children in remote Australia; 2) compare these to best practices; and 3) identify opportunities for improved service provision.

## Methods

A comprehensive search strategy was developed to find relevant articles from medical literature databases using MeSH Headings and key words. Grey literature was searched at target websites including government agencies, research centres, Indigenous health portals, and non-government health-related or Indigenous advocacy organisations.

All literature (1990-2013) describing existing rural and remote health services, health service use or needs in relation to Indigenous children (0-18 years) was included. Papers were excluded if they focused on: health services in foreign countries or large metropolitan areas; adult, dental and oral, or sexual health; education of children or health professionals; social or cultural issues; attraction and retention of health professionals; substance abuse and misuse; child care centres; the judicial system; health policy; or papers not written in English (Figure 1).

Abstracts or summaries were reviewed to determine relevance and suitability for inclusion. Data from all relevant papers were extracted and summarised by two authors (Appendix includes further details).

### Databases searched

Electronic databases of medical literature (Medline, Cumulative Index for Nursing and Allied Health Literature (CINAHL), Psychological Information Abstracts Services (PsycINFO), Web of Knowledge, Excerpta Medica Database (EMBASE), Educational Resources Information Centre (ERIC), and Scopus) were searched for relevant publications. Health department and other relevant websites were also searched (Figure 1).

### Literature Search

A search strategy was developed with a medical librarian. MeSH headings were identified, and key words were formatted to ensure derivatives of words were not excluded (e.g. a\*). The use of "AND" or "OR" strengthened the sensitivity and specificity of the search. If this search strategy was not possible due to

the capacity of particular search engines, then the best possible combinations of words were selected relevant to different subjects.

## **MeSH Headings**

The MeSH Headings used in this search included Health Services; Community Health Services; Primary Health Care; Family Practice; Child Health Services; Adolescent Medicine; Health Services, Indigenous; Rural Health; Rural Health Services; Rural Population; Rural; Child; Pediatrics; Oceanic Ancestry Group; and Australia were used in the search.

## **Key Words**

The key words searched were: Health services; community health services; primary health care; family practice; adolescent medicine; Indigenous health; Indigenous health services; rural; remote; rural health services; child; infant; paediatrics; paediatrics; Indigen\*; Aborigin\*; Oceanic Ancestry group; allied health; Australia.

## **Searching the Grey Literature**

A list of target websites was devised, including those of government agencies, research centres, Indigenous health portals, and non-government health-related or Indigenous advocacy organisations. Commonwealth and State/Territory websites were also searched, as were relevant university-based research centres, private research agencies, NGOs and international bodies. National databases focusing specifically on health or Indigenous people were also searched. Online searches were conducted using key words and terms similar to those used to search the academic literature.

The following websites and databases were searched: Informit Indigenous Collection (IIC); Lowitja Institute, Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) and Australian Aboriginal Health *Info-net*. Websites of the Federal and State Governments Health departments and associated agencies; Parliamentary Hearings and Senate committees, Commonwealth and State; Aboriginal medical services; regional health services; Australian Human Rights Commission; National Health and Medical Research Council (NHMRC) of Australia; Royal Australasian College of Physicians; Royal College of Paediatrics and Child Health (UK); Australian Bureau of Statistics, Australian Institute of Health and Welfare (AIHW), Research Institutes focussing in Indigenous health e.g. Menzies, Centre for Aboriginal Economic Policy Research at Australian National University, Telethon Institute for Child Health Research (Western Australia), Centre for Remote Health, and Australian Primary health care research institute (APHCRI).

Many grey literature documents published by government agencies, including policy or strategy documents, draw on peer-reviewed literature. Online documents, which were not simply summaries of the issues, but provided original insights or evidence regarding the best approach for delivering health services to Indigenous people living in remote areas, were included in the review (Table 2).

**Table 2. Summary of literature included in this paper.**

<b>Focus of Paper</b>	<b>References</b>
Health services in Australia	(35, 85)
Child health services	(20, 41, 71, 72, 86, 87)
Health service utilisation and access	(3, 8, 23, 24, 66, 88-98)
Rural health care services or primary health care in a rural setting	(58, 59, 62, 67, 68, 78, 99-103)
Ambulatory services	(2, 31, 32)
Emergency department presentation patterns	(104-107)
Telehealth	(108-112)
Other, including the remote nursing workforce, specialist outreach services, multidisciplinary teams, allied health services, fly-in-fly-out (FIFO) models, the Royal Flying Doctors Service and barriers to providing effective primary health care for children	

### **Inclusion Criteria**

Medical publications and grey literature produced between 1990 and 2013 were included if they described existing rural and remote health services, health service use or needs in relation to Indigenous children (0-18 years).

### **Exclusion Criteria**

Papers were excluded if they focused on: health services in foreign countries or large metropolitan areas; adult, dental and oral health, sexual health, education of children or health professionals, or social or cultural issues; attracting or retaining health professionals to rural and remote locations; substance abuse and misuse; child care centres; the judicial system; health policy or papers not written in English (Figure 1) because the breadth of literature on these topics was too extensive to incorporate into this review paper.

### **Review Process**

Two authors reviewed abstracts or summaries of publications identified in the search to determine their relevance and suitability for inclusion. If there was doubt about the suitability of a paper, the full text was

retrieved and evaluated. If there was a dispute about relevance of a paper a third author assessed the paper. The reference lists of all relevant papers or reports were also reviewed for additional relevant citations. Data from all relevant papers were extracted and summarised.

## **Defining Health Services**

We defined 'health services' as any primary, secondary or tertiary paediatric health services, including paediatric specialists, remote nursing clinics, allied health professionals, hospital inpatient and emergency departments, patient retrieval through the Royal Flying Doctor Service, fly-in-fly-out (FIFO) services, paediatric outreach services, multidisciplinary teams, tele-paediatrics and videoconferencing systems. Additionally, the public health approach to health services provides surveillance of the health service through the consideration of epidemiology, health and ill-health.

## **Defining Health Systems**

We defined 'health systems' or 'healthcare systems' around the definition supplied by WHO. A good health system incorporates the organisation of people, institutions and resources to deliver health services, which meet the needs of all people. This requires resilient and considered financial procedures, a qualified and well-paid workforce, reliable evidence-based information on which to base decision and policies, adequate and well-maintained facilities and logistics allowing the delivery of quality medicine and technologies.

## **Defining Rural and Remote**

The classification scale used to define rural and remote varied between papers, however the Rural, Remote and Metropolitan Areas classification (RRMA) and the Accessibility/Remoteness Index of Australia (ARIA) scales were most commonly used (21, 22). Papers that focused on metropolitan hospitals, populations or health services were excluded.

# **Results**

## **Peer-reviewed Literature**

We identified 1505 papers (370 duplicates) and reviewed 1135 abstracts (Figure 1). Of these, 992 (87.4%) were excluded. Following full text review of the remaining 143 (12.6%) papers, 45 were deemed highly relevant (4.0% of the 1135 initially reviewed).

Publications exploring topics such as the physical or mental health of Indigenous children, neonatal health and infant mortality, disease prevention and maternal or family health, were only included if they reported on health service utilisation. Additionally, we included papers that discussed child health services in Australia, health service utilisation and access, primary or other health care in rural/remote settings, ambulatory services, emergency department presentation patterns, and barriers to effective primary health care for children (Table 1).

## Grey Literature

Forty-seven reports from the grey literature were classified as highly relevant (Table 1).

Results are presented under the following subheadings: 1) Existing health services for Indigenous children in remote Australia; 2) Workforce challenges in remote settings; 3) Characteristics for an effective service; 4) Models of care and solutions.

Table 1  
Grey Literature Search Summary

Website type	Number of websites that yielded results	Number of documents found
Federal government agency	6	10
Other national policy bodies (eg HWA, RRHA)	2	4
National NGOs (RFDS, AMA, NRHC, RCH)	6	3
State/Territory government agencies	5	6
State-based NGOs	5	1
Indigenous health NGOs – regional	4	3
International NGOs	1	1
Research Centres	15	18
Unpublished	N/A	1
Total		<b>47</b>

AMA, Australian Medical Association; HWA, Health Workforce Australia; NRHC, National Rural Health Conference; RFDS, Royal Flying Doctor Service; RRHA, Rural and Regional Health Australia

### 1) Existing health services for Indigenous children in remote Australia

#### Children's Use of Services

Indigenous adults are more likely to use health services than non-Indigenous adults (23). Indigenous children are less likely than non-Indigenous children to have visited health services in the last 12 months (mean 2.5 v 3.1,  $p < 0.001$ ), used maternal and child health services (OR = 0.35, 95%CI: 0.24–0.49), general practitioners (OR = 0.45, 95%CI: 0.35–0.64) or paediatricians (OR = 0.52, 95%CI: 0.35–0.77), but more likely to be hospitalised (17% vs. 9.9%,  $p = 0.01$ ) (24). Proportionally, more Indigenous than non-Indigenous infants live remotely or very remotely (13.0% vs. 3.7%,  $p < 0.001$ ) (24).

Authors acknowledge an interplay between social structures and health outcomes, however it is unknown whether outcomes are worse for Indigenous infants because of lack of access to services or whether lower levels of parent education, employment and private health insurance, younger maternal age and increased rates of single parenting (24). It is difficult to assess causality from cross-sectional data comparing access to health services with outcomes, and these data may not incorporate Aboriginal-specific health services (24). No theoretical framework (such as the Anderson behavioural model) was used for modelling the risk factors for health service utilisation and health outcomes (24).

A retrospective cohort study of 756 mothers and their 1494 children over 14-years (1984–1997) at three metropolitan Western Australian general practices demonstrated children's utilisation of health services was positively correlated with their mother's use of services, mothers' stress level, psychosocial problems in the child, and quality of the mother-child relationship (25, 26). Additionally, the rate of primary health services use by children is influenced by their health status, age, birth order (elder children attend more frequently), socioeconomic status (disadvantaged children have an increased likelihood of visiting a doctor) and whether the appointment is physician initiated (if so, children are more likely to attend) (25, 26). There is a positive correlation between sibling attendance and rates of health service utilisation (25). Integration of maternal and child health services increases children's use of health services (25, 27).

### **Access to Effective Health Services and Challenges and Barriers to their Provision**

Health professionals who work in or visit remote communities understand the barriers to access health services, but limited evidence is published (28, 29). Identified challenges to delivering effective and equitable health services to Indigenous children in remote areas include:

- poor access (distance between services and communities, dirt roads, lack of patient accommodation).
- poor communication and infrastructure (internet/telephone access, public transport, sewerage, water supply, electricity);
- lack of skilled health professionals (high staff turnover, limited accommodation options);
- environmental factors (high temperatures, flooding, risks associated with travelling long distances in remote Australia);
- health service factors (inflexible health service structures, poor communication and coordination, resource constraints e.g. inadequate staff/equipment);
- economic factors (cost of transport, food, accommodation);
- issues of cultural safety (lack of interpreters, poor doctor-patient communication; a lack of cultural competency with different perceptions of health, illness and medicine, historical associations of hospitals with death, mistreatment of Indigenous people) (28, 29).

*The Kimberley Regional Aboriginal Health Plan* (1999), developed with representatives from Aboriginal, state and commonwealth government-controlled organisations provides recommendations to improve Aboriginal health in the Kimberley region of Australia (30). They recommend coordination of planning

and service delivery for primary health services, growing the Aboriginal health workforce, increasing prevention and promotion and ensuring culturally sensitive collaboration and communication (30). The collaborative nature of this discursive report gives credence to the concerns raised and recommendations and provides goals for improving access to gold standard health services for remote dwelling Indigenous Australians (30).

Interviews with health practitioners, outreach specialists, regional health administrators and patients in remote Northern Territory (NT) communities provided opinion on the challenges and barriers to accessing health services in remote settings (29). Informed by this information, a specialist outreach service was developed and implemented, which increased four-fold the number of gynaecological consultations over 3-years (1996–1999) (27). Equivalent increases have not been seen for documented specialties without outreach services (29).

Access depends on service availability (including out of hours), travel/transportation barriers, costs, and language and cultural barriers (28, 29). There is no standard measurement for access to health care for children in remote Australia. The validity of the Hospitalisation for Ambulatory Care Sensitive Conditions (ACSH) measurement of access to health services and avoidable morbidity is debated for communities with limited health service (31). The ACSH has been used to measure access based on physician supply and potentially preventable hospitalisations, however increased physician supply is not the sole determinant of health care quality (31). A higher ACSH score correlates with poorer access (31). Increased residential remoteness, lower income, lower educational level and current smoking status were associated with a higher ACSH score, reflecting the impact of social determinants on access to health care (31). ACSH provides a measure that is independent of tendency to seek care, disease burden or prevalence, and workforce supply (32). Measuring access requires incorporation of many factors, including the features of a health care system and characteristics of individual patients or target populations.

An alternative measure of health service availability is population-based distribution of health facilities (33). The distribution of intensive care units (ICU) correlates with population distribution but accessibility varies geographically. For example, the median distance to the nearest ICU is 161.7km in Western Australia and 7.6km in the ACT (33). However, there is a lack of data on health service availability by population and a lack of evaluation of the relationship between access to primary health care services and health outcomes in rural and regional Australia (4, 34, 35). It is difficult to compare services across Australian States and Territories because each jurisdiction manages its own health budget and policies. It is also very difficult to compare health systems performance at a jurisdictional level, apart from reviewing CoAG-monitored health indicators (e.g. Close the Gap targets). Life expectancy, mortality rates, morbidity from chronic diseases and lifestyle factors (obesity, smoking, poor nutrition, physical activity) are used as measures of population health but are less relevant to children (36). Indigenous child health outcomes do not solely reflect health system functioning, but are impacted by social and environmental factors, case-mix and public health campaigns (37–39).

Authors commented on distances and access to allied health services for children in remote settings, notably paediatric speech pathologists (40). Most (98%) allied health services were not delivered at the ideal rate of at least once per week (40) and over 30% of rural NSW residents live beyond the 'critical maximum distance' of 50km from the therapist, beyond which patients become less likely to travel. Speech pathology is particularly important because of high rates of otitis media, hearing problems and poor language skills (41) in remote Indigenous child populations, which impacts intergenerational transference of cultural knowledge.

Extremely isolated communities depend on the Royal Flying Doctor Service (RFDS) for basic primary health care services and to coordinate emergency response (42). Communities rely on aeromedical transport for health professionals as well as treatment and evacuation for emergent and non-emergent care (43). From 2003-5, 61% of all aeromedical evacuations were for respiratory disease (21%), obstetric conditions (15%), gastroenteritis (14%) and injury or poisoning (11%) (43). This places strain on local primary health care (PHC) centres and clinic staff and highlights the need for support and funding to meet prevention and PHC demands (43). Many people transported by RFDS would benefit from access to multidisciplinary care (53/78, 68%) or shared specialist care (41/78, 53%) provided locally (44).

### **Social and cultural factors impact service use**

Social and cultural factors influence service use by Aboriginal people. Lack of cultural competence among health professionals deters use (28). Some health professionals have ethnocentric attitudes and lack understanding of Aboriginal culture (28). Disrespectful or inappropriate communication and racism also impact engagement (28). The 2006 Census showed that 573 Indigenous people (1.5% of WA's Indigenous population aged over 15 years) were employed in health-related occupations, comprising 1.1% of the total WA health workforce (45). Nationally, Indigenous people constitute 2.0% of Australia's health workforce (45). Appropriate training in cultural competence of non-Indigenous staff and employment of more Indigenous staff would increase access to culturally appropriate health services (28).

### **Funding Complexity**

Local, state and national governments, privately funded organisations and NGOs provide funding for remote health services. The Medical Specialist Outreach Assistance Program (MSOAP), was funded to improve delivery of health services in remote Australian (46). In some jurisdictions (e.g. NT) this funding is accessed directly from the Department of Health. In others, such as Queensland (*Check-up*) and WA (*Rural Health West*), non-government entities receive the MSOAP funding and report back to the Australian Government (46). Part of MSOAPs responsibility is to ensure services funded by them are linked with existing services. Access to this funding requires lobbying by medical professionals and a competitive application process (46).

Overall, expenditure for Indigenous health services is higher than for non-Indigenous services (47). Per capita expenditure on public hospital services is higher for Indigenous than non-Indigenous Australians (47). During 2008-09, a total of \$3,700 million was spent on Indigenous health services. Per capita

expenditure for Indigenous Australians was 155% of the expenditure for other Australians, being even higher for Indigenous people in remote (241%) and regional (144%) settings (47).

## **1) What do we know about the workforce in remote locations?**

### **High Pressures On Workforce**

Aboriginal Medical Services (AMS) and specialist services in rural and remote Australia report increased workforce stress, compared with metropolitan services (41, 48). In rural settings there is a high demand for services. Physicians report lack of local services in rural/remote vs. urban settings for audiology (11.1% v 0%), ENT (33.3% v 3.9%) and hearing aid provision (37.7% v 1.9%)(41). Children in rural and remote settings experience longer wait times for audiologists than urban children (18.3% v 1.9% waited over the recommended 3 months) (41). Between 1996–2001, the Australian health workforce increased by 14.7%, yet the number of health workers/100,000 population remains low in remote locations (1498/100,000 vs. metropolitan 3005/100,000). (49, 50). The number of specialists is increasing, however there remains unequal distribution with oversupply for urban locations (50). In 2001 there were only 75 specialists in the “Top End” region of the NT. They were required to care for a population of 148,641 people spread across an area of over 500,000 km<sup>2</sup>, with 30% living in rural and remote areas. Of these 75 medical specialists only 12% reside in rural and remote areas, compared to 28% of the general Australian population.

There are many workforce initiatives to help alleviate rural GP service pressures, many of which rely on encouraging doctors into rural settings (51–54). Up-skilling of paediatric nurses and Aboriginal Health Workers aims to alleviate some workforce shortages (55). Multidisciplinary assessments (incorporating medical, nutritional, psychosocial and allied health) of children living in remote communities have demonstrable benefits including: recognition of ill-health risk factors across multiple domains; individual assessments to develop individualised management strategies; and coordinated collaboration between teams which avoids service delivery gaps (51–54). Regular meetings that facilitate communication between health professionals, disciplines and organisations are beneficial in establishing clear roles and responsibilities (67, 69). Employment of administrative staff for coordination and communication with/for communities would alleviate some time pressures experienced by health personnel and improve organisation (53). Additionally, improved infrastructure (e.g. telehealth, internet and IT services) would support workforce in remote locations (54).

Improving access to primary, secondary and tertiary health services is crucial to improve child health (29). In remote communities access to care is limited due to a lack of transport and accommodation options (53). Increasing public transport options for isolated communities or implementing other delivery models (e.g. outreach or telemedicine services) may increase equality of access and service use(27). Paediatric outreach services to rural and remote areas benefit children and their families due in part to reduced need to travel to services. Such services also increase cultural understanding of health professionals and engages communities (56–59).

### **Optimal Staffing For Remote Health Services**

Optimal health professional staffing levels for Australia were not found during our search, other than for nurses (9). However, some regional planning documents prescribe optimal ratios for their region (30, 60). Based on recommended population ratios for Central Australia, there should be 1 Aboriginal Health Worker per 100 Aboriginal people, 1 community nurse per 250 people and 1 doctor per 600 people (61). It is suggested that communities with a stable population of 250 should have a health service located within the community as well as access to on-call services. Communities of between 100–250 people should have a clinic staffed by two health professionals, either senior Aboriginal Health Workers or registered nurses (9). These targets were established in 1997 and meeting them continues to be a challenge due to difficulties with workforce retention and resources (9).

## **2) What constitutes an effective service?**

### **Measuring the Effectiveness of a Health Service**

The effectiveness of a health service can be indicated by its use: that is, the number of presentations; the system performance; or the community health outcomes (35). Health services in remote settings do not use these frameworks. The Australian Institute of Health and Welfare compared health system performance across all jurisdictions (2012). They reviewed health service efficiency and appropriateness; responsiveness to needs of Indigenous people; accessibility; continuity of quality health care; and health care systems capability and sustainability (45).

Immunisation rates for Indigenous children in 2011 were comparable to rates in non-Indigenous children at 2 years of age (88% and 91% were fully vaccinated in WA, respectively) (45). However, Indigenous children aged 0–14 years in WA are less likely to receive an annual health check, a rate slightly lower (93 per 1000) than for Indigenous children nationally (110 per 1000 for 2010-11) (45). In WA between 2008-10, hospitalisation rates for potentially preventable conditions were 13 times higher for Indigenous people (413.6 per 1000 population) than non-Indigenous people, and much higher than the for NSW, Vic, QLD, SA and NT combined (137 per 1000, rate ratio 4.8) (45).

A comprehensive review of the underlying features of effective primary health care models in rural and remote Australia highlighted the importance of supportive policy, positive State or Territory relations, and community commitment (62). Fundamental requirements for effective and sustainable health services include proper governance, management, community involvement and leadership, adequate financing, infrastructure and ample workforce supply (62). The effectiveness of a service was measured using a Primary Health Care (PHC) framework which assessed health service process and outcome measures (e.g. increased recruitment, decreased wait times, decreased suicide rates and GP isolation, increased community participation, increased workforce retention, improved cost effectiveness, increased referrals, improved access to records) (62).

Many authors highlight the importance of evaluating health services to inform best practice, ensure improvements are maintained, and inform establishment of future health services (3, 35, 55, 59, 62–66). Evaluation highlights key features of optimal health services (67), however, the evaluation method needs

to be carefully considered. For example, Key Performance Indicators (KPI) can be used to quantitatively assess Indigenous PHC services. However KPIs have been discredited because their narrow focus overlooks programs underpinned by social theories and Indigenous concepts of health, and thus they fail to provide an accurate reflection of the contribution of a service to health (68). Several studies discussed assessment of the sustainability and effectiveness of remote health services through continuous quality improvement (CQI, Fig. 2) (64–66). CQI involves ongoing collection of data through community-based research, which aligns with Indigenous concepts of health and service delivery principals, to determine the functionality of an organisational system and enable implementation of improvements (64, 65). CQI has proved very effective for assessing PHC of chronic conditions in remote Australia (64, 65, 69). When applied to regional services, CQI has resulted in large increases in the number of patients accessing PHC services (an increase from 12 to 4000 patients from 1995–2009) (66). Thus, qualitative assessment of programs is also important.

### **Limitations to the effectiveness of health services**

Remoteness, inadequate medical workforce, and poor coordination negatively impact health service effectiveness (9). In some very remote settings (such as Fitzroy Valley, WA) Community Health staff, whose primary role is in preventative health care, are forced to deliver acute medical care (42). There is an increase in the proportion of children receiving nursing (rather than doctor) consultations with increased remoteness (42). The total number of midwives and child health nurses in very remote Australia has decreased in the last decade, aligned with a decrease in the number of nurses obtaining midwifery qualifications (65% in 1999 to 29% in 2008) (70). Efforts to address these issues are being made by the NT Department of Health and Families by supporting remote area nurses through midwifery training (70).

AMS are an important means of culturally appropriate service delivery for remote Indigenous children. In WA (2004), fewer than 5% of doctors and specialists were located in remote and very remote areas and only 5.8 full time equivalent (FTE) doctors worked in culturally tailored organisations such as AMS (42).

There are challenges in attracting and retaining clinicians, and many programs do not address the cultural, locational and financial barriers that prevent Indigenous children from gaining access to physicians (42, 71).

Individual health professionals in the remote health workforce are often forced to manage extremely complex, chronic disorders with a lack of resources and limited options for specialist referral (51) and this is rendered more difficult by professional isolation. Paediatricians are required to meet a greater demand than their capacity and resources allow, due to limited PHC services. As a result, time is allocated to children with the greatest urgency and acuity, thereby restricting time available for primary and preventive health care services (72).

### **Difficulties with communication, coordination, collaboration**

Many services have difficulty communicating with patients and other health professionals, due to cultural incompetence and technological barriers and struggle to ensure cooperation, collaboration and coordination between different organisations (28, 51) and remote communities. This is aggravated by

challenges in case planning and organising referrals (51). It has been recommended that there should be community paediatricians who commit solely to advocating for, and co-ordinating outreach services to alleviate this burden from organisations and other health professionals (72). Currently, it is estimated that for each day of clinical work one day of administration and liaison is required (51, 72).

Few online sources designed to assist in the co-ordination of health services exist. In the NT, the Department of Health's online Remote Atlas has a section specifically for SONT (Specialist Outreach NT). Protocols to facilitate efficient and co-ordinated health service delivery to remote communities, including SharePoint access, an online calendar with schedules of all specialist and other health services, would improve services (73).

### **3) Models of Care/Solutions**

#### **Recommendations**

Numerous models of care recommendations for improving Indigenous health services exist, but the challenge remains to ensure implementation and effectiveness (9, 35).

One recommendation is for State and Territory Health Departments to engage more with other relevant health organisations and develop Aboriginal child health care policies (27). Health care delivery may improve with a national policy framework for maternal and child health (74), child and adolescent mental health, and child nutritional supplementation (67, 76). Implementation of supportive programs to augment Aboriginal Community Controlled Health Services, particularly services with a focus on health promotion and early intervention, would improve child health outcomes (53, 54, 75).

One example of an all-encompassing model of care for remote Australia is provided by the *Kimberley Aboriginal Health Performance Framework* (KAHPF) (9). Key recommendations address social determinants. Measures to improve services include better coordination and inter-agency collaboration; use of innovative programmes of health promotion targeting specific groups and using culturally appropriate, locally relevant resources; allied health support for children in classrooms; School Entry Check for early identification of health and developmental problems; screening for common childhood problems including anaemia and growth faltering; better access to specialists; use of diagnostic protocols; clear referral pathways; long term funding for successful programs; and ongoing training of health professionals (9). This model provides a gold standard for health services developed in the future and highlights the complexity of providing a thorough and effective service.

#### **Best Practice: Moving towards health equity for Aboriginal children**

#### **Models of care**

Another best practice public health model for child and adolescent health entails prevention programs, early and secondary intervention, with individual child multidisciplinary assessments (76). This would maintain a reactive health system, meeting individual needs, whilst instilling preventative strategies within community. A holistic approach to health engages families, ensures Indigenous involvement in

identifying problems and informing solutions for child health, growth and development (51). Ensuring availability of continued care is essential (51).

Meeting optimal child health service requirements and providing accesses for remote communities underpins best practice service models (51). Adjustments to improve the current service provision system include increasing Indigenous involvement in service delivery and prevention programs, improved access to services, dismantling cultural barriers to increase use of existing services, utilising a multidisciplinary approach for diagnosis and management, increasing IT capabilities, integrating mother and child health services and workforce initiatives. It would be useful to develop a national framework for child health services in remote health settings (9).

### **Community Engagement**

It is essential that there is full Indigenous community leadership and involvement (28, 53) via collaborative partnerships with external organisations (53, 66, 77, 78). Ongoing evaluation would ensure the opinions of Indigenous families utilising services are recognised and highlight priorities for child health (27). If possible, community based child health services and organisations should be controlled and managed by community members (53). Enhancing Aboriginal Health Worker training and numbers would help dismantle cultural and language barriers that limit service use and effectiveness (75). Generation of protocols for individual agencies, outlining best practice policies for child health and guidance to ensure culturally appropriate services are delivered (27, 74).

### **Improving Communication**

Communication challenges between health professionals, inter-agency, communities and health departments could improve through infrastructure improvements, increasing the use of videoconferencing and shared electronic medical information systems (27, 53). Videoconferencing (Telehealth) is a valuable tool for specialist consultations in remote settings and acts to support health professionals (79–81). In isolated areas videoconferencing saves patients time and money and alleviates stress by improving access to better services. Videoconferencing enables education and career development for medical professionals (79–82).

Increasing information technology (IT) knowledge for health personnel and increasing access to IT staff for technological failures provides additional challenges in remote settings. Incorporating these services may help fill health service gaps in remote locations and improve Indigenous child health.

### **Access To Services**

Provision of social support and accommodation for patients and families travelling to access health services, may deem it a positive experience, increasing the likelihood of subsequent visits, and in turn improving health outcomes (53). Alternatively, increasing accommodation availability for health professionals in community would increase face-to-face time, facilitate multidisciplinary care and

reducing wait times (27). Improving existing community transport services, by providing cars and buses, will improve access to services (27).

## **New Services**

When new health services are developed, it is important to ensure there is adequate infrastructure and staffing to avoid overloading them. Collaboration with organisations to improve public and environmental health (including the development of preventative health strategies) and the social determinants of health is imperative (45, 53, 74). Ensuring new services undergo intrinsic evaluation of their process and outcome indicators and continuous quality improvement (CQI) is crucial.

## **Discussion/conclusions:**

We found a high burden of child health needs in remote communities, inadequacies in existing health services and barriers to service delivery (e.g. distance, staffing and cost). There are proposed models for better service delivery, but these require co-ordination and collaboration of existing services and involvement of local Indigenous communities. Medical professionals in remote locations need additional financial, emotional, educational and collegiate support to increase focus towards patients. Support could be provided through the use of new technologies and strategies for attracting and maintaining staff. It may be useful to implement an all-encompassing public health approach or develop a national framework to address the determinants of health, including ensuring infants receive the best start in life.

If early onset chronic diseases are to be prevented then investment in schools' provision of adequate nutrition and health literacy, and pre-conception, pregnancy, early infancy and childhood programs are paramount. The importance of the Developmental Origins of Health and Disease (DOHaD) needs to be embodied in the health promotion message of the first 1000 days of a child's life. These are windows of opportunity for prevention and unless incorporated into policy and programs will precipitate late intervention in adulthood – which demands a reactive health system.

The cost to deliver health services for Indigenous people are often quoted as greater than non-Indigenous (e.g. \$ per head), but there is little consideration of causes, chronicity and complexity of service delivery for these increased costs. These higher costs relate to increased morbidity amongst populations; remote service delivering expenses; and incentives for health professionals (53). Indigenous people may be sicker, services less efficient or conversely more effective than urban and city services, and any or all of these factors could contribute to greater costs. This literature does not indicate targeted expenditure, only that money is spent.

A lag between prevention of health conditions with improvements at the social determinants of health level, improved service delivery and resulting health outcomes exists, particularly for child populations (53). Funding for Indigenous child health services has increased, however, so have the implementation costs in keeping with inflation and demand (83). The case-mix method for allocating hospital funding uses national averages, cost weights and length of stay as benchmarks (38). It has been criticised as

further disadvantaging Indigenous children who present more frequently, have complex illnesses and comorbidities, and prolonged hospital stays (22.6% v 1.5% non-Indigenous children) (38). They receive inadequate funding for their disease progression, and an unfair funding distribution which may further impair service delivery (38). We did not aim, and are not able, to discuss how investment to support social determinants of health would alter patient outcome but instead our findings underscore the importance of responsive, high quality, well-resourced and funded reactive and preventative health models. Savings could result from better primary health care and prevention models for children in remote communities, resulting in disease prevention and improved disease management (27). Expenditure on appropriate, well-resourced services across areas of greatest need (e.g. maternal and child health programs) in remote Australia would have a strong impact on child well-being (27, 84).

## **Abbreviations**

AMS – Aboriginal Medical Services; CQI – Continuous Quality Improvement; DOHaD - Developmental Origins of Health and Disease; ENT – Ears, Nose Throat (Otorhinolaryngology) Surgeon; FIFO – Fly-in Fly-out; KPI – Key Performance Indicators; NSW – New South Wales; NT – Northern Territory; PHC – Primary Health Care; RFDS – Royal Flying Doctors Service; SA – South Australia; WA – Western Australia.

## **Declarations**

### **Authors contributions**

The authors declare that they have no competing interests. PJD performed the research, analysed the data, interpreted the results, drafted the manuscript, wrote the final manuscript. KT performed the research, collecting and interpreting the data, proofed and approved the manuscript. JO conceived the study, designed the study, and performed research. MC conceived the study, designed the study, and performed research. HEJ interpreted the results, drafted the manuscript, and read and approved the final manuscript. DH interpreted the results, drafted the manuscript, and read and approved the final manuscript. EJE conceived the study, designed the study, performed the research, read and approved the final manuscript. ALCM conceived the study, designed the study, and performed the research, read, reviewed, edited and approved the final manuscript. All authors contributed to and approved the final manuscript.

### **Acknowledgements**

Thanks to Prof Kirsty Douglas and A/Prof Kathryn Glass for edits and contributions to the final version of the manuscript.

### **Funding**

The Lililwan project was supported by the National Health and Medical Research Council of Australia (NHMRC) (Elizabeth Elliott, Practitioner Fellowships 457084 and 1021480, and project grant 1024474); the Australian Research Council (Jane Latimer, Future Fellowship 0130007); the Australian Government Departments of Health and Ageing (DoHA); and Families, Housing, Community Services and Indigenous Affairs (FaHCSIA); Save the Children Australia and the Foundation for Alcohol Research and Education. Pro bono support was provided by M&C Saatchi, Blake Dawson solicitors, and the Australian Human Rights Commission. Alexandra Martiniuk was funded by an NHMRC TRIP (Translating Research into Practice) Fellowship (2016–2018). Philippa Dossetor is supported by a part-time PhD scholarship through the Australian National University Medical School and the College of Biology, Medicine and the Environment, a University of Sydney Poche Institute Scholarship and by a part-time Avant DiT scholarship.

### **Consent for publication**

Not applicable.

### **Competing interests**

The authors declare that they have no competing interests.

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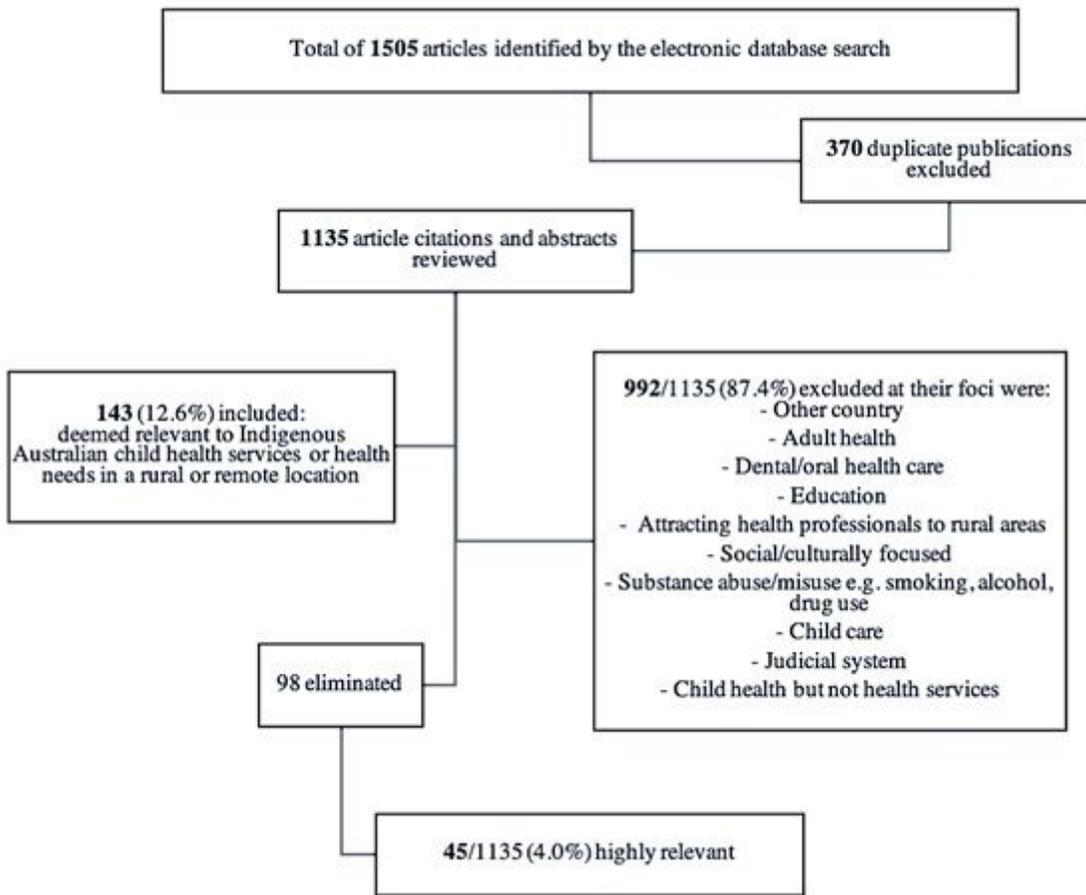
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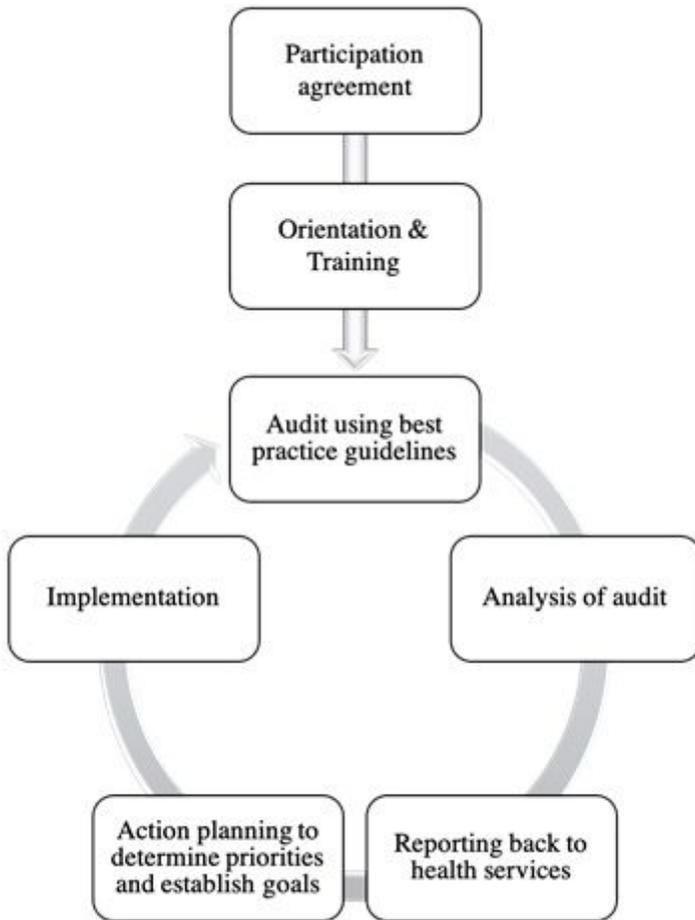
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## Figures



**Figure 1**

Search results from electronic databases of medical literature



**Figure 2**

A CQI approach with the continuous cycle ensuring quality improvement and service delivery.