

Participatory systems approach to health improvement in Australian Aboriginal children

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Summary

The factors underlying poor child health in remote Australian Indigenous (Aboriginal and Torres Strait Islander) communities are complex. There is a lack of consistent and reliable information that allows: (i) the identification of priorities or areas of particular need at household and community levels; (ii) monitoring progress over time; and (iii) the assessment of the impact of interventions. This paper describes the process and methods used to identify the factors that underlie high rates of poor child health in remote Aboriginal communities in the Northern Territory (NT). This work has led to the development of indicators and tools suitable for use within a continuous quality improvement programme. Indigenous and non-Indigenous individuals from a range of disciplines and backgrounds participated in study activities. This allowed for a range of perspectives, including scientific, lay and Aboriginal perspectives, to be accommodated and reflected in study outcomes and outputs. Study participants identified a wide range of physical and social factors that they believe underlies poor child health in remote Aboriginal community contexts in the NT. The approach taken in this study provides some confidence that the indicators developed will be seen as meaningful and appropriate by the residents of remote communities and key stakeholders. Two tools have been developed and are now in use in the practice setting. One assesses social determinants of health at the community level, for example water supply, food supply. The second applies to individual households and assesses the social and environmental indicators that are recognized as placing children at greater risk of poor health and development outcomes.

Key words: Indigenous; child health; participatory research; ecological approach

INTRODUCTION

The health outcomes for Australian Aboriginal children living in remote Northern Territory (NT) communities are much worse than those of other Australian Aboriginal and non-Aboriginal children (Li *et al.*, 2007; Northern Territory Government Board of Inquiry into

the Protection of Aboriginal Children from Sexual Abuse, 2007; Australian Institute of Health and Welfare, 2011). The extent of the challenges in the NT is obscured because data on Aboriginal and Torres Strait Islander mortality and morbidity outcomes are aggregated and reported at levels that do not reflect

regional-level variation. National Indigenous infant mortality rates are twice that of non-Indigenous infants. However, the NT Indigenous infant mortality rate is approximately twice that of New South Wales (NSW). Currently, there are around 9.2 infants per 1000 births for Indigenous infant males in NSW compared with 19.6 per 1000 in the NT (Australian Institute of Health and Welfare, 2011). Rates in remote communities are even higher.

Rates of hospitalization for acute lower respiratory tract infection (e.g. pneumonia) among Indigenous infants are substantially higher than those in the wider Australian population. They are also higher than American Indian and Alaskan Native infants or infants in developing countries (O'Grady *et al.*, 2010). Similarly, chronic illnesses like otitis media are endemic among children in many remote NT Aboriginal communities. The rate of otitis media among Indigenous children in the NT is greater than three times that described as a major public health problem by the World Health Organization (Coates *et al.*, 2002). Despite rates of acute rheumatic fever rapidly falling among the general population in Australia, rates continue to rise among Indigenous children aged 5–14 years old in the NT (rate 150–380 per 100,000) (Parnaby and Carapetis, 2010). In the NT, 92% of people with rheumatic heart disease are Indigenous and (of these) 85% live in remote communities and towns.

The causes of poor child health in remote NT communities are complex (Sutton, 2005; Australian Bureau of Statistics and Australian Institute for Health and Welfare, 2008; Bromfield *et al.*, 2010). Many of the causes are similar to other Indigenous populations who are experiencing the legacy of colonization and rapid acculturation. This historical legacy and on-going disadvantage across all social determinants of health means that progress to improve child health continues to be slow. This is despite improvements in the medical management of child health conditions, better access to health services and some increase in health literacy (McDonald *et al.*, 2008; Australian Government, 2009; McDonald and Bailie, 2010). Due to the endemic nature of many infections in communities, children experience rapid re-infection following completion of medical treatment. Re-infection is promoted by a number of factors, including household crowding, poor housing conditions and poor household and community environmental health.

The continuing 'silo' approach to policy development, programme initiatives and service delivery means that planning and implementing improvements in remote community infrastructure and service delivery are

not co-ordinated and often not sustained. For example the health benefits likely to be gained from the provision of additional and improved housing can be negated by poor sewerage and waste management or the poor governance of housing repairs and maintenance services (McDonald, 2011). In the case of extreme disadvantage, improvement is required across a range of social determinants before health is likely to improve (Strategic Review of Health Inequalities in England Commission, 2011).

Currently, there is a lack of consistent and reliable information that allows for: (i) identification of priorities and areas of particular need at household and community levels; (ii) monitoring progress over time and (iii) assessing the impact of interventions. The development and application of indicators for use at household and community levels offers a mechanism to meet this need. The initial objectives of this research included: (i) to identify the factors underlying high rates of poor child health in remote Indigenous communities; and (ii) identify evidence-based indicators that reflect these underlying factors. This work was then extended to the development of tools to support collection and effective use of indicators within a quality improvement framework. Two tools were developed: (i) the Healthy Community Assessment Tool (HCAT)—a tool to assess if communities had the infrastructure and programmes necessary for community members to be able to make healthy lifestyle choices (McDonald *et al.*, 2013)—and (ii) The Household Assessment Tool (HAT)—a tool developed for use in a proposed early intervention programme aiming to prevent progression from growth faltering to failure to thrive (FTT) among infants.

In this paper, we describe our approach to identifying indicators. We briefly describe the research translation activities that led to the development of the community and household assessment tools and the application of these tools in practice.

METHODS

We searched electronic databases and the grey literature to identify indicators currently in use. In this search, we used a range of terms associated with generally recognized child health risk factors and the social determinants of health. We then used a systems-oriented iterative and participatory approach (de Savigny and Adam, 2009) to identify locally relevant risk factors, to develop frameworks, to identify key indicators, and to develop tools. This approach was taken as previous research findings suggest that indicators that do not reflect the view of all major stakeholder groups (including consumers) are less

likely to be accepted (Renhard and Ryan. 2001; Etches *et al.*, 2006). A systems-based ecological approach was taken as the health, development and well-being of children (as well as the functioning of their families) is thought to be profoundly shaped by environmental influences (Hall and Ellieman. 2003; Irwin *et al.* 2007).

Study activities included: (i) engaging with Aboriginal and non-Aboriginal stakeholders in communities to explain the project and invite their participation; (ii) inter-sectoral and multi-disciplinary workshops to identify risk factors and develop causal pathways and draft frameworks; (iii) one-to-one and small group discussions with Aboriginal and non-Aboriginal key stakeholders in communities to review frameworks and identify key child health risk factors as perceived by community members and (iv) on-going dialogue and interaction between researcher and Aboriginal community workers (ACWs) to share knowledge and develop new knowledge. Multiple methods were employed to incorporate and accommodate a range of perspectives, including scientific (e.g. biological plausibility), lay perceptions and Aboriginal perspectives.

Ethics approval for the study was obtained from the Human Research Ethics Committees in the Top End of the NT and in Central Australia. Informed written consent was obtained from community peak bodies and individuals who participated in the study.

Setting

Aboriginal and non-Aboriginal key stakeholders from eight remote communities (four in the Top End of the NT and four in Central Australia) were invited and agreed to be involved in the initial development stage. This number of communities and their geographical locations were considered sufficient to allow for good cultural, social, geographic and climatic diversity. The process used for the identification of indicators and development of tools should enhance the relevance of the indicators and tools to the diverse range of remote Aboriginal communities in the NT and Indigenous communities located in other Australian states.

The population size of study communities ranged from 250 to 2300 persons. The communities all belong to different Aboriginal language groups and community members generally speak English as a second language. Basic services such as electricity, water supply, police, primary school, health clinic and store are available in all communities. The eight communities are all classified as geographically remote according to the Accessibility/Remoteness Index of Australia (ARIA) classification system (Australian Institute for Health and Welfare, 2004).

This classification indicates that community members have least access to a range of goods and services when compared with other Australian communities. The communities were geographically widely dispersed. They included two island communities only accessible by aircraft with flight times of 30 min and 2 h. The remaining communities were accessible by road. The driving times from the closest regional centre to the six communities ranged from 3 to 7 h. The roads to these communities are unsealed and are not passable all year round. Seasonal rain results in road closures of up to 2 months or more. The Top End of the NT has sub-tropical weather with associated monsoonal weather pattern. Central Australia is arid and experiences more extremes in hot and cold temperatures.

Indicator development processes

The first phase of our process consisted of an initial consultation with Aboriginal and non-Aboriginal key stakeholders. The second phase involved refinement of our frameworks and models. The third phase involved the development and specification of indicators and included research transfer and translation activities and the development of tools (Figure 1).

Initial consultation phase

Interdisciplinary key stakeholder workshops and framework development: Two-day workshops were held in regional locations (Darwin, 32 participants; and Alice Springs, 13 participants). The workshops aimed to develop the causal pathways for common childhood infections (respiratory, diarrhoeal and skin disease) and poor growth appropriate for remote communities. Participants included Aboriginal environmental health workers, environmental health officers (EHOs), nutritionists, remote area nurses, paediatrician, social worker, representatives from peak Aboriginal health organizations, Aboriginal and non-Aboriginal persons representing community councils and Government welfare, policy, health promotion and housing officers. All participants had experience working in remote communities and many had travelled from remote communities to participate.

Framework development was informed by the constructs of the Multiple Exposures–Multiple Effects (MEME) Model (World Health Organization, 2004) (Figure 2) and the Driving Force, Pressure, State, Exposure, Effect, Action (DPSEEA) Framework (Corvalán *et al.*, 1996) (Supplementary Data, Appendix). We decided this framework was most appropriate to use because its elements and constructs take account of the disadvantage across social determinants that underlie poor child health

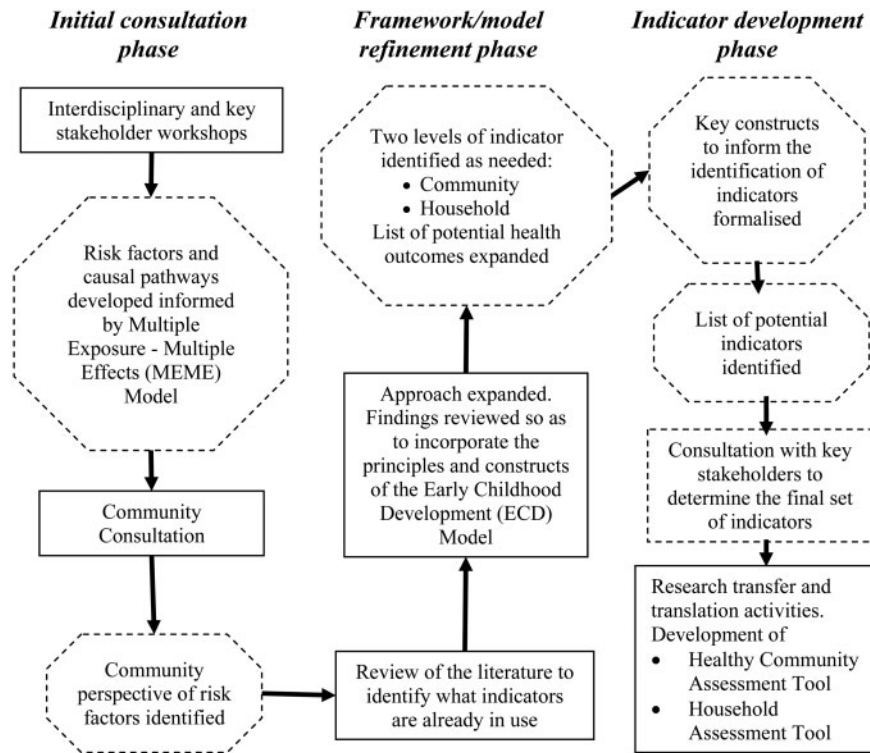


Fig. 1: The indicator development process.

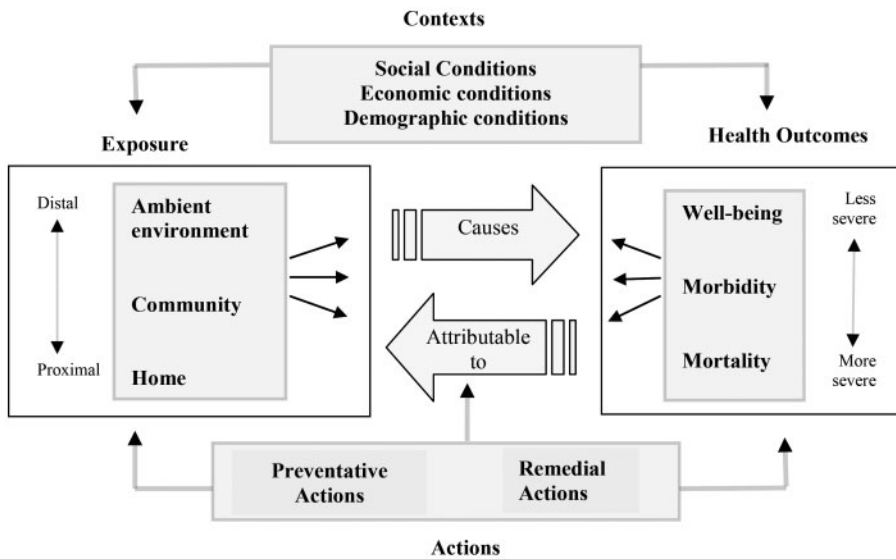


Fig. 2: The Multiple Exposure–Multiple Effects Model (MEME) (World Health Organization, 2004) p. 11.

outcomes in remote NT Aboriginal communities. The first step in using the framework involved workshop participants together identifying the key 'driving force' or upstream factors that generally lead to poor child health outcomes in remote Aboriginal communities. They decided that the driving factors should reflect social determinants of health and the headings 'poverty', 'housing', 'education', 'social conditions', 'remoteness' and 'governance' were chosen. Next, participants worked in small interdisciplinary groups to identify the risk factors and causal pathways that led to the specified poor child health outcome. Participants were encouraged to develop frameworks that reflected a story explaining how and why children become sick in remote communities ([Supplementary Data, Appendix](#)). Next, the small groups came together for discussion. This enabled integrating the elements of each framework into a single representative framework. We repeated this process for each health outcome. Developing the framework for the first child health outcome was time consuming. However, it soon became apparent that the upstream and intermediate risk factors for each of the infectious child health outcomes were consistent. As a result, the development of the other frameworks proceeded more rapidly. Some downstream factors did vary, reflecting different infectious disease transmission routes. Participants believed that poor governance at a number of levels (and across all government and non-government agencies) was an important factor in the lack of progress to improve children's physical and social living conditions in remote communities. Participants felt strongly that sustainable improvements in children's health and well-being would not be achieved without first addressing upstream factors.

The frameworks developed at the Darwin and Alice Springs workshops were very similar. This was not surprising as it is widely recognized that social determinants of health are the key underlying cause for most poor health outcomes for Indigenous Australian peoples ([House of Representatives Standing Committee on Family and Community Affairs, 2000](#); [Devitt *et al.*, 2001](#); [Australian Bureau of Statistics and Australian Institute for Health and Welfare, 2008](#); [Australian Institute for Health and Welfare, 2009](#)). Some environmental health risk factors were different. This reflects the climatic and geographical differences of tropical northern Australian and the arid desert conditions of Central Australia. The frameworks developed in Darwin and Alice Springs were combined, and all workshop participants were sent draft copies for review.

Community consultation—perspectives of risks to child health. Two researchers (one Aboriginal and one

non-Aboriginal) and the EHO who regularly visited each community participated in community consultation and data collection activities. In each community, a local Aboriginal person who was proficient in English and the local language was employed to liaise with community members and provide interpreter services (if required). Initial consultation occurred in six remote communities (three in the Top End of the NT and three in Central Australia). Four communities (three in the Top End and one in Central Australia) received return visits. Only one community in Central Australia received a return visit due to on-going logistical issues and the set time for completing the study. The aim of the return visit was to (i) confirm the accuracy of framework contents and (ii) ask Aboriginal key stakeholders their perceptions of what was causing children to get sick in their community. The length of stay in each community was 2–3 days. The local Aboriginal liaison officer employed introduced the researchers to community key stakeholders who were then invited to participate in this research. Discussions took place in various locations, including at individuals' homes, in public meeting places and service provider offices. We consulted with a minimum of three and maximum of eight Aboriginal persons in each community. The number consulted varied, depending on who was available and willing to meet with the researchers. The number of persons available was influenced by what else was happening in the community at the time of the visit. Between 4 and 12 Aboriginal and non-Aboriginal service providers in each community were also interviewed. The range of service providers consulted included housing repair and maintenance staff, essential services officer, shire service manager, store manager, sports and recreation officers and grounds maintenance staff.

During community visits, discussion centred on explaining the content of draft frameworks and their purpose. Aboriginal key stakeholders quickly comprehended the constructs represented in the frameworks and in some cases engaged in lengthy discussions concerning risk factors and their order in the causal pathway. They advised that some small changes and additions were necessary but they generally confirmed that the risk factors and linkages that make up the causal pathways and frameworks are accurate. The frameworks proved to be very useful tools to explain to both Aboriginal and non-Aboriginal persons the likely underlying causes of poor child health in their communities. This information was new to many, and some acknowledged that involvement in the project had given them a greater understanding of the problems they were trying to address.

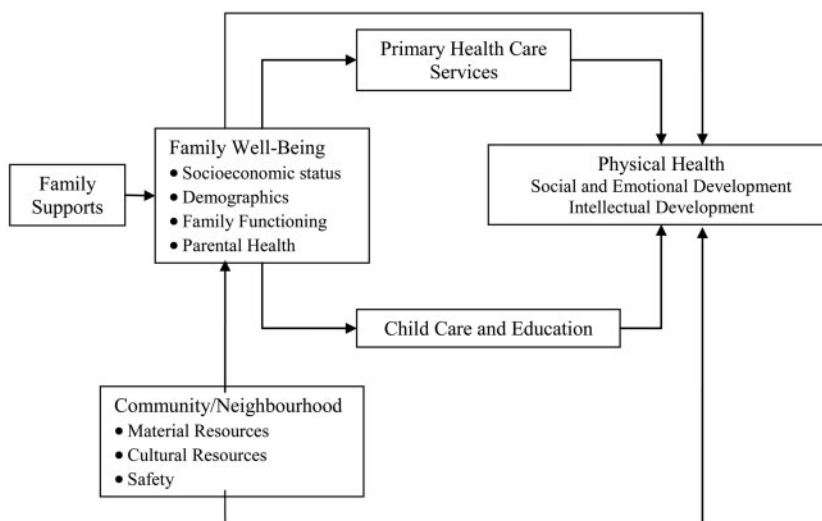


Fig. 3: Model of Early Childhood Development (Brown *et al.*, 2004 p. 6).

On the return visits to four communities, the Aboriginal key stakeholders reported that dust, dogs, rats, cockroaches, litter and overturned rubbish bins, poor housing and crowded and dirty houses were making their children sick.

Identification of indicators. A broad search of the literature showed that a large number of child health indicators are already in use both in Australia and internationally. Most are outcome indicators for use at country level and concern child mortality and morbidity. However, there are other indicators, for example—crowding index, that might be classified as an intermediate (or process) indicator which potentially has both social and disease transmission applications. These would be appropriate to use in the remote Aboriginal community context. In view of the wide choice, we decided to choose indicators from those already available where appropriate.

Framework/model refinement phase

After (i) reviewing the content of frameworks; (ii) taking into account community perspectives; (iii) consulting with key stakeholders in communities and government agencies; (iv) taking account of practical implementation issues and (v) making comparison with the available literature, we decided that we should take a broader approach in identifying indicators. The MEME Model focuses on environmental threats to children's health and takes account of a range of hazards of different natures (e.g. water, air, food, soil), in different media (e.g. water, air, food, soil), in different settings (home, school, community) and in

relation to different activities (e.g. playing, working) (World Health Organization, 2004). We considered that a hazard reduction-based approach, while pertinent, was too narrow to take account of all the issues that underlie poor child health in remote Aboriginal communities. To address this, the principles and constructs of the MEME Model and those of a contextual model of early childhood development—the Model of Early Childhood Development (ECD) (Brown *et al.*, 2004) (Figure 3) were combined. The ECD Model takes a developmental approach and incorporates the social influences of family, community and local institutions that affect child health and wellbeing outcomes. The constructs of this model are better able to include access and availability of programmes and services (and other social determinants of health) among a disadvantaged and marginalized group in a resource rich country (such as Australia).

Based on the constructs of the two models, we found that two categories of indicators are required: (i) community-level indicators; and (ii) household-level indicators. The household-level indicators reflect the 'state' and 'exposure' constructs in the MEME Model and the 'family well-being' and 'family support' constructs in the ECD Model. Community-level indicators reflect the MEME Model's 'context' constructs and the 'community/neighbourhood', 'primary health care services' and 'child care and education' constructs of the ECD Model. This approach facilitates identifying a core set of indicators that cover the breadth of potential causal pathways for a number of poor child health, development and well-being outcomes.

Indicator development phase

Health and well-being outcomes. Potential outcome indicators were selected based on: (i) the epidemiological profile of child health in remote communities; (ii) indicators already identified and in use; and (iii) existing reliable data already available at the community level. Potential outcome indicators identified include: the prevalence of skin, respiratory and diarrhoeal disease; low birth weight; underweight children; anaemic children; percentage of children fully immunized; mean number of decayed missing or filled teeth among primary school children; substantiated cases of child abuse and neglect; numeracy and literacy at 7 years; ear drum perforations of children <2 years; teenage pregnancy; breast feeding; cause of hospitalization of children <2 years; infant mortality.

Community-level indicators. The community-level indicators reflect the 'driving force' and 'pressure' levels of the MEME/DPSEEA Framework (Supplementary Data, Appendix). These will cover the presence and quality of community infrastructure and services, for example water supply; sewerage system; electricity supply; housing (especially outstanding items of repairs and maintenance and number of families on the waiting list for housing); solid waste disposal; food supply (community store); community drainage, roads and footpaths; sports and recreation facilities; pest control and animal management. Other potential community-level indicators concern health, early childhood education and childcare services, and parenting programmes. Workshop participants suggested that non-Aboriginal and Aboriginal staff turnover rates are a suitable proxy to measure the quality of service provision. This is because it takes time (usually months to years) to develop the relationships and trust necessary to be effective in a position in a remote Aboriginal community.

Household-level indicators. Household-level indicators are 'state' and 'exposure' levels of the MEME/DPSEEA Framework. They relate to children's immediate physical and social living environments (Supplementary Data, Appendix). Household-level indicators were categorized under seven constructs drawn from the MEME and ECD models and include:

- i. Housing infrastructure: functionality. This includes the items required to undertake healthy living practices (Pholeros P, 1993), and the presence of fencing, insect screens and screen doors.
- ii. Housing infrastructure: hygienic condition and child safe environment. This includes the presence of excessive mould; faeces in the immediate living

environment; poor condition of bedding; and cockroaches and rats (and other pests or vermin).

- iii. Availability and access to basic household utilities. This includes the continuous supply and efficient and safe functioning of water, sewerage and electricity supplies at household level. Also, the frequency and standard of other services such as waste removal.
- iv. Crowding. This indicator reflects potential for the spread of infections and some poor social outcomes.
- v. Food security, food safety and nutrition. This includes the quality and quantity of food stored in the house; cooking facilities; cooking utensils, crockery and cutlery; and how and where children sit to eat.
- vi. Social environment: including unemployment; level of indebtedness (behind with the rental payments); use of alcohol and illicit drugs; tobacco use; involvement with gambling; proportion of residents who have mental health problems or disabilities that require care and fighting/domestic violence (in the home or in the immediate neighbourhood).
- vii. Child development: including if any children exhibit signs of behavioural disorders, have hearing loss, or have any developmental problem; the presence of toys and books in the house; whether children attend child care, pre-school or school.
- viii. Householders' issues: including if community services are meeting their basic needs. For example housing repairs and maintenance; dental, health and educational services; pest control and animal management; law and order; food supply (store); and sports and recreation programmes and facilities.

Our aim was to match the household-level indicators with the objectives and performance indicators in service agreements between government and community agencies. We believe this approach has the potential to enhance engagement with key stakeholders, promote their support in using indicators and maximize the usefulness of the data collected. There is also the potential for the data to be useful for informal or formal monitoring and evaluation purposes across a range of programmes.

Identification of the final set of indicators and tool development phase

We had set criteria to identify and prioritize a final set of indicators outside of the practice context. However, a funder and a service provider were already aware of this



Fig. 4: Infrastructure and programs considered important to promote good health across a community population: key domains and indicator categories.

research and requested that tools be developed to meet their needs. This led to the development of two tools.

The Healthy Community Assessment Tool. The funder requested that an assessment tool be developed to ascertain if communities had the programmes and infrastructure necessary for preventing chronic disease. As the antecedents for chronic disease occur *in utero* (Barker and Clark, 1997; Hoy and Nicol, 2010; Sayers and Singh, 2010) and in childhood (Hertzman and Power 2006; Sellers *et al.*, 2008, 2009; Cunningham *et al.*, 2011), the community-level indicator domains already identified (Figure 4), along with a system to objectively score indicators, form this tool. One NT Regional Shire Council agreed to trial the HCAT and nominated four of the remote communities under their administration to be study sites. These communities are all in the Top End of the NT. A published paper providing a full description of how the domains were identified, the scoring system used and the processes and outcomes concerning trialling the tool is published elsewhere (McDonald *et al.*, 2013).

The Household Assessment Tool. The manager of a health service in a remote Aboriginal community invited the researchers to develop (incorporating the indicators identified) a tool to be used in a proposed early intervention programme aiming to prevent young infants experiencing growth faltering from progressing to FTT. The programme was to be delivered by ACWs who might have had little formal education. These workers are mostly mothers and grandmothers. They have extensive knowledge of their culture and traditional child-rearing practices and are respected members of their

community. A workshop for eight ACWs was held using the MEME/DPSEEA models so ACWs could develop their own stories about how children in their community become ‘skinny kids’ (severely underweight or FTT). Workshop outcomes closely reflected those of study findings. This highlights again the role of the social determinants of health leading to poor child health outcomes, and the complexity of the causes of poor child health in this context (Supplementary Data, Appendix). Importantly, ACWs came to understand that mothers of young infants require more support and that ‘blaming’ them for their child’s frequent infections and poor growth will not improve health outcomes.

Study findings identified a list of potential indicators to use but the method of measurement was not always clear. This challenge was met by discussing the issues with the ACWs and them coming up with innovative and novel means to meet this challenge. For example for the indicator ‘carer abuses drugs or alcohol’ the ACWs devised the following question:

Does the carer do things that makes it look like they love waymi (marihuana) or kava or grog (alcohol) more than their yothu (baby) or djamarrkuli (children)?

Another example concerns the living environment:

- i. Do the people in the house say they have a problem with rats in or around the house?
- ii. If YES, how big is the problem?
 - a. BIG (nests in the house, stealing and eating food, biting them or running over them when they sleep at night, walk on the babies when they are asleep)
 - b. MEDIUM (nests in the roof, hear the rats in the roof, sometimes eat or steal food)

c. SMALL (sometimes nests in the roof, hear the rats in the roof, rats don't come inside the house) The HAT incorporates graphics so ACWs with little formal education can complete the assessment. A good deal of time was spent on ensuring ACWs understood the indicators and what was intended to be measured. Time was also spent translating the content of the tool from English to Yolgnu Matha (the ACWs' first language) to English to ensure comprehension of the information in the tool. The ACWs are now using the HAT as the initial step in an early intervention intensive family support programme that has been developed to prevent FTT among children in their community.

DISCUSSION

The approach and methods used in this study identified the complex factors that underlie high rates of poor child health in remote Indigenous communities. Use of multiple methods allowed for a range of perspectives, including scientific (e.g. biological plausibility), lay perceptions and Aboriginal perspectives to be accommodated and reflected in study outcomes and outputs. Evidence-based indicators already developed and in the public domain were included to promote broader application of the tools. The need for a wide range of indicators meant that good quality evidence was not available to support all the indicators identified. Therefore, some are supported by what is recognized as 'best practice' or considered to be biologically plausible. The approach and methods that informed study activities provides some confidence that residents of remote communities and other key stakeholders will see the indicators and indicator scoring systems as meaningful and appropriate, thus promoting the incorporation of the indicators into future systems oriented, community-based participatory action research programmes to improve child health in remote Aboriginal communities. The information provided by these indicators should be useful for participatory action research projects that aim to empower communities to identify local and innovative solutions to address current barriers to achieving improved child health outcomes in this context. We are pursuing funding for a participatory action research project that will incorporate these indicators, drawing on the principles and constructs contained in the Healthy Cities and Healthy Village health promotion models (Tsouros, 1995; Howard, 2002; Baum, 2007).

The HCAT and the HAT are generic tools addressing the social determinants of health in a complex environment. HCAT is currently being used to inform one-off planning in a number of remote NT communities and to

collect baseline data for evaluation and research purposes. The feedback received indicates that the HCAT addresses the need for a resource for community-level service providers and local government representatives where there has been a lack of suitable resources. In one remote NT Aboriginal community, the ACWs use the information collected through the HAT to gain an overall picture of why a child's growth is faltering and to prioritize which intervention/s are likely to have the greatest impact in supporting the carer to provide appropriate care for the child. A regionally based Aboriginal Medical Service is using an adapted HAT to develop children at-risk health-care plans, and at least one other remote community uses the HAT in less structured programmes. Our study design has enhanced the potential for the indicators to be suitable for use across the diverse range of remote NT communities. However, more research is needed to ensure that the household-level indicators' scoring descriptions are widely recognized and accepted. The strength of both tools is that reproducible measures are provided to score indicators, and this promotes their suitability for use within a continuous quality improvement (CQI) programme. Use of the indicators can meet the current need for consistent and reliable information on the underlying causes of poor child health in remote communities.

The HAT is for use at individual household level but the information collected by the tool can be aggregated to provide a community profile. The HCAT is for use at individual community level but the information collected can be aggregated across a number of communities to provide regional and NT profiles. There are a number of potential uses for this information, including:

- i. gaining a comprehensive picture of how well the community environment supports healthy living;
- ii. assisting with prioritizing individual, household and community needs;
- iii. assisting decision-making about allocating resources;
- iv. assessing, documenting and advocating for community public health needs;
- v. evaluating programmes; and
- vi. implementing a community environmental health CQI programme.

CONCLUSION

Our study design provides some confidence that the indicators identified will be seen as meaningful and appropriate by residents of remote Aboriginal communities (and other key stakeholders). The HCAT and HAT were

developed based on study findings and have been introduced into practice. These tools can be used by community health workers, community leaders, EHOs, health promotion workers and government officers at all levels. They support change to environmental health and social conditions for improved child health in remote NT Aboriginal community.

SUPPLEMENTARY MATERIAL

Supplementary Material is available at *HEAPRO* online.

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