Early Childhood Nutrition and Anaemia Prevention Project

Summary Report

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Northern Territory Government

Queensland Government

Roebuck Health Services

The Rural Clinical School of Western Australia

The University of Western Australia

The University of Notre Dame Australia

The Fred Hollows Foundation

menzies school of health research

James Cook University Australia

Sunrise Health Service

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The Early Childhood Nutrition and Anaemia Prevention Project would not have been possible without the dedication and enthusiasm of the community based workers and health professionals involved. A full list of people who have contributed to the development, implementation and evaluation of the project is available in the comprehensive report.

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Heinz Australia provided 'Sprinkles' philanthropically for the project. A special thanks to Jessica Ramsden for pursuing the procurement of 'Sprinkles'.

"Three areas are critical foundations for healthy child development: stable, responsive, and nurturing caregiving with opportunities to learn; safe, supportive, physical environments; and appropriate nutrition."

Margaret Chan, Director-General, World Health Organization [1]

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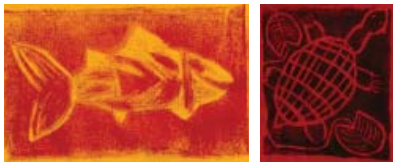

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1 Introduction

The Early Childhood Nutrition and Anaemia Prevention Project (ECNAPP) was implemented in six remote communities, four in the Northern Territory (NT), one in Cape York in Queensland (Qld) and one in the East Kimberley region in Western Australia (WA). Project planning and development commenced in 2006, with project activities occurring between 2010 and 2012.

This report summarises the project development, program implementation, results of the evaluation of both project processes and outcomes, and provides recommendations for future policy, programs and research addressing infant and young child nutrition and anaemia in northern Australia. A comprehensive technical report is also available at www.hollows.org or by contacting The Fred Hollows Foundation Indigenous Australia Program on 08 8920 1400.

Exclusive breastfeeding in the first six months of life followed by introduction of healthy complementary foods with continued breastfeeding provides infants and young children with the nutrition they require for healthy growth and development [4].

1.1 Importance of nutrition for mothers, infants and young children

Good nutrition in infancy and early childhood is one of the essential foundations for healthy growth and development [1]. Pregnancy and the first two years of life provide the 'critical window' in which optimal nutrition is needed to prevent lasting deficits in physical health, brain development and human capital [2]. The effects of poor nutrition in pregnancy and the first two years of life are persistent and intergenerational [3]. Therefore, improving nutrition of Aboriginal and Torres Strait Islander mothers, infants and young children is essential to close the gap in the inequalities in health, education and economic development between Aboriginal and Torres Strait Islander Australians and non-Aboriginal Australians.

Mothers who are poorly nourished before and during pregnancy, have diabetes in pregnancy or smoke are more likely to have infants and young children who are born growth restricted or premature [5]. Suboptimal breastfeeding, inappropriate complementary feeding and repeated infections in the first two years lead to micronutrient deficiencies, growth faltering, and if uncorrected, to stunting[1] [2].

Growth restriction *in utero*, stunting and iron deficiency and anaemia in early life affects the structure and function of the growing baby's brain, affecting physical and cognitive development, reducing potential for educational attainment and economic participation [6]. Undernutrition as well as rapid weight gain during infancy, leads to increased morbidity and mortality due to chronic disease in the child's later life [3, 7]. Maternal obesity and diabetes in pregnancy are also linked to later chronic disease in the child [8].

There are few documented studies of successful programs preventing undernutrition, anaemia and obesity in Aboriginal and Torres Strait Islander infants and young children [9]. Drawing from international evidence, programs incorporating breastfeeding and complementary feeding counselling by peer counsellors or lay health workers have demonstrated positive impact on the prevention of undernutrition [10]. Home-based fortification of complementary foods with iron and other vitamins and minerals using multi-micronutrient powders such as 'Sprinkles' which are mixed into infants and young children's solid food have been found to reduce anaemia and iron deficiency [11]. Such programs may have potential to reduce the burden of undernutrition and anaemia in remote Aboriginal and Torres Strait Islander[2] communities [12].

1. Stunting is defined as a length-for-age or height-for-age z-score (LAZ/HAZ) of < 2 Standard Deviations (SD)
2. For the remainder of the document the authors refer only to Aboriginal peoples. Whilst the authors acknowledge that some people living in the project communities may also be Torres Strait Islander, most people living in these communities identify as Aboriginal.

1.2 Background to project development

The Early Childhood Nutrition and Anaemia Prevention project arose because of community and health service concern about the reliance on intramuscular iron injections to treat anaemia and lack of focus on preventive approaches in remote Aboriginal communities across the NT. Communities and health services were seeking alternative solutions to treating and preventing anaemia, and a better understanding of the diet of infants and young children in remote communities.

A collaborative project steering group comprising non-government organisations (NGOs), Aboriginal Community Controlled Health Services (ACCHS) and government health departments was formed to oversee the development of a project investigating the feasibility and acceptability of preventive micronutrient supplementation with 'Sprinkles' along with community-based nutrition promotion.

1.3 Partners in the Early Childhood Nutrition and Anaemia Prevention Project

- The Fred Hollows Foundation
- Sunrise Health Service
- Northern Territory (NT) Department of Health
- Kimberley Aboriginal Medical Services Council
- Department of Health, Queensland (formerly Queensland Health)
- The Rural Clinical School of Western Australia, The University of Western Australia
- Menzies School of Health Research
- Boab Health Services
- Heinz Australia

2 Project description

2.1 Project Goal

Determine the feasibility and acceptability of a community nutrition program, involving micronutrient fortification across northern Australia to improve nutrition and prevent iron deficiency anaemia of Aboriginal infants and young children aged 6-24 months.

2.2 Project objectives and activities

Improve knowledge and practices of carers of 0-24 month old infants and young children about optimal infant and young child feeding and iron deficiency anaemia prevention through:.

- Nutrition education and counselling by Community Based Workers for mothers and carers
- Development of local resources to promote key messages about infant and young child nutrition
- Promotion of infant and young child nutrition to the broader community.

Provide a preventive multi-micronutrient supplement ('Sprinkles') to 6-24 month olds for home fortification of complementary foods, by:

- Procuring 'Sprinkles' for home fortification of complementary foods and supplying them to communities
- Distribution of 'Sprinkles' to mothers of 6-24 month olds and education of mothers about their use.

Build capacity of community based nutrition workforce, health services, and other relevant organisations, through:

- Employing, training and support of Community Based Workers (CBWs) at each community to deliver project activities
- Development and implementation of training about infant and young child feeding counselling.

Build research capacity of project staff and partners, and primary health professionals to evaluate the program, through:

- Evaluation of the project using participatory methods
- Training of project teams in research methods.

Determine the costs and the benefits of the program, by:

- Undertaking an economic evaluation of the project[3].

Inform future policy and program development to prevent iron deficiency anaemia and improve infant and young child nutrition, through:

- Collection of information on dietary intake of infants and young children and young children
- Evaluation of the project and wide dissemination of findings.

3. The economic analysis of the project had not been undertaken at the time of this report and is not reported on here.

2.3 Project teams

Project teams for each community comprised local Aboriginal Community Based Workers (CBWs), a Project Coordinator and a range of Project Associates, who provided support to the CBWs.

CBWs were employed on a casual or part-time basis depending on the preference of the employer. The management and degree of support and resources available to the CBWs varied between communities.

2.4 Project timeline

Project activities were undertaken between 2010 and 2012. Evaluation was undertaken between 2012 and 2013. A timeline of activities is described in Appendix 1.

2.5 Evaluation methods

Quantitative and qualitative evaluation methods were used. Information from primary health care services was collected from the infants and young children's medical records, including weight, length/height, fingerpick HemoCue haemoglobin (Hb) and documentation of anaemia treatment. Information was collected from mothers and other carers about usage of 'Sprinkles' and the dietary intake of their infants and young children. Qualitative data included interviews and Most Significant Change [13] stories conducted with CBWs, mothers, community members, health centre staff and other stakeholders.

3 Key achievements and challenges

ECNAPP was an ambitious project with a short timeframe and there were many challenges in implementing such a project, not all of which were overcome during the project timeframe. This was the first documented comprehensive program focusing on strategies for anaemia prevention and improved nutrition of Aboriginal infants and young children across multiple remote communities in northern Australia.

Achievements

- High participation rate: 84% of the estimated 6-24 month old population enrolled in the project.
- Increased understanding of the extent of anaemia in Aboriginal infants and young children and strategies to prevent and treat anaemia.
- Insight into the dietary patterns of Aboriginal infants and young children in remote northern Australian communities.
- Adaptation of the WHO Infant and Young Child Feeding Counselling Course for Australia. This program is now available as *Talking about Feeding Babies and Little Kids*.
- Increased research capacity, nutrition knowledge and confidence of Aboriginal CBWs, establishing a valuable resource for future research and programs.
- Good retention of Aboriginal CBWs, and establishment of partnerships between non-Indigenous health practitioners and CBWs.

Challenges

- Relatively short timeframe to implement a new program in multiple communities within a complex environment.
- Difficulty obtaining employment contracts, adequate workspace, resources and consistent support for the CBWs.
- Inconsistent work attendance of CBWs for a range of reasons impacted on the project activities, in particular, distribution of an adequate supply of 'Sprinkles' to mothers.
- Difficulty engaging some community members, particularly young mothers.
- Communication and coordination of multiple stakeholders and project management across three jurisdictions.
- Limited research expertise within the project team and relative inexperience of project coordinator in running such a large project.

4 Summary of key findings and discussion

The project evaluation revealed important findings about nutrition and anaemia prevention in Aboriginal infants and young children and has implications for related research, program development and delivery of primary health care services. There were major challenges which were not resolved within the project timeframe; however, there were also some important achievements.

4.1 Anaemia and growth

Infants and young children had much higher rates of anaemia and at an earlier age than expected

There were very high rates of anaemia amongst infants and young children enrolled in ECNAPP. Of the 166 infants and young children who had a baseline measurement of haemoglobin (Hb) using HemoCue from routine primary health care, 44% were anaemic, which is classified as a severe public health problem by World Health Organization (WHO) definitions [14].

Nearly 90% (205/229) of infants and young children enrolled in ECNAPP were anaemic at least once between 6 and 24 months of age. This is consistent with the high prevalence (68%) described in 6-12 month old infants in two remote NT communities [15]

Hb measurement at 6-<9 months of age was available for 163 of the infants and young children enrolled in ECNAPP. Of these infants, 56% (91) were anaemic at 6-<9 months, which is higher than expected. Other reports of anaemia prevalence among Aboriginal infants in northern Australia are also high, 38% of 6 month old infants in remote Cape York Aboriginal communities [16] and 26% of 6-<12 month olds in remote NT communities were anaemic at their most recent Hb check [17].

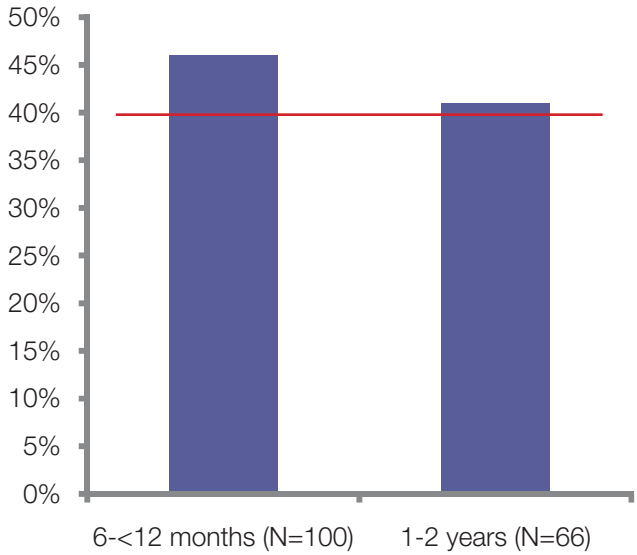

Figure 1
Anaemia prevalence at baseline of infants and young children enrolled in ECNAPP. Red line indicates severe public health problem.

Infants and young children had high rates of stunting, low birthweight and pre-term birth

The rates of stunting were also very high (19%), similar to the high NT-wide prevalence in 2011 of 11% among 0-<12month olds and 18% among 1-3 year olds [17]. Rates of both underweight (5%) and overweight (5%) were also higher than the approximately 3% expected in a healthy population [17]. Rates of stunting, underweight and overweight were variable between communities.

Low birthweight (12%) and pre-term birth (14%) were also consistent with the high national and NT averages for Aboriginal infants [18].

These data reinforce that poor growth remains an important issue for many Aboriginal infants and young children in northern Australia.

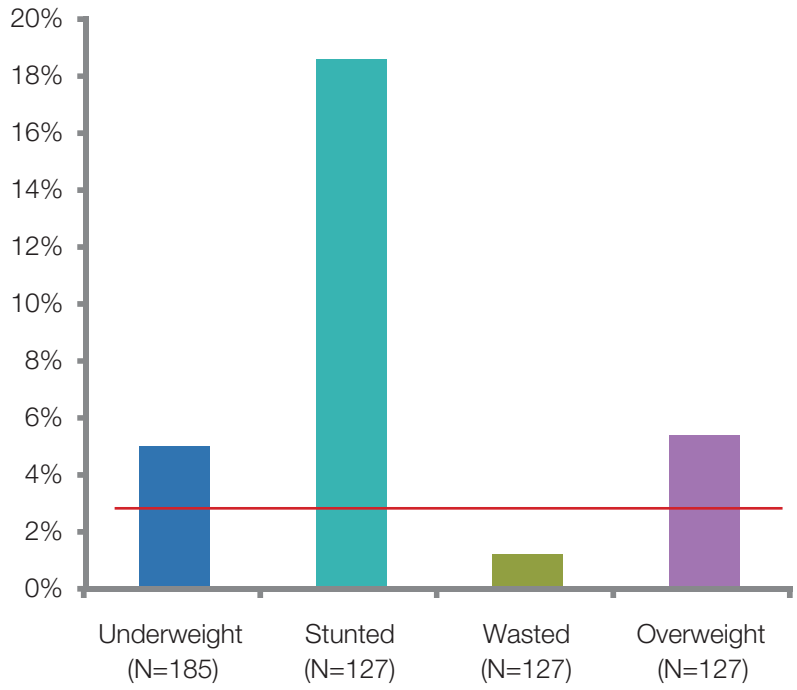

Figure 2
Growth indicators of infants and young children enrolled in ECNAPP. Red line represents the ~3% normally expected in a healthy population.

Given the high prevalence of anaemia and stunting it is likely there were widespread underlying deficiencies of multiple nutrients among infants and young children in the participating communities. WHO estimates that prevalence of iron deficiency is approximately twice that of anaemia in populations where anaemia prevalence is high [14]. Based on this assumption nearly all infants and young children in the project were potentially iron deficient. Investigation of whether or not the high prevalence of anaemia and stunting found in ENCAPP is widespread across all remote northern Australian communities should be considered a high priority.

Given the serious consequences of anaemia and stunting to health, education and economic attainment, an increased focus is needed on prevention, starting with the mother before pregnancy and continuing through the first two crucial years of the infant's life. A better understanding of other possible causes of anaemia within the first six months of life is also needed.

Implications

- High rates of anaemia seen in infants at 6 months indicate that preventive strategies need to start earlier.
- The relative contribution of maternal and other factors related to anaemia in infancy need to be better understood.

Recommendations

- To determine if the high rates of early onset anaemia found in ENCAPP are widespread across remote communities in northern Australia and take action to address the findings.
- Investigate the relative contribution of micronutrient status and other determinants of anaemia in Aboriginal infants and young children from the remote communities across northern Australia.
- Investigate strategies to address the determinants of anaemia and effectively prevent anaemia and iron deficiency in Aboriginal infants and young children in remote northern Australian communities.

4.2 Dietary intake

CBWs were trained in collecting Food Intake Questionnaires (FIQs) and collected 381 from mothers of infants and young children enrolled in the project. There were two components to the FIQ: a 24-hour history and a Food Variety Checklist. Mothers were asked to recall what their baby had to eat the day before (24-hour history) as well as answer whether their baby usually consumed items from a checklist of common foods and drinks (Food Variety Checklist). Although it was planned that all infants and young children would have at least two FIQs (baseline and end), this did not happen. One hundred infants and young children had more than one FIQ completed.

Breastfeeding

Breastfeeding rates are high and breastfeeding continues into the second year of life.

Breastfeeding is the natural and normal way to feed infants and young children and has important benefits to the health and wellbeing of both mother and baby [19]. A positive finding, based on the Food Variety Checklist, was that mothers reported that they usually breastfed their 6-24 month old infants and young children (82% of all FIQs). Breastfeeding appears to be maintained into the second year of life with mothers reporting usual breastfeeding in 80% of FIQs of 12-24 month olds. Formula feeding was reported in 20% of all FIQs, which is of concern as there are various risks such as increased risk of diabetes [20] associated with formula feeding and the reasons for formula use should be further explored.

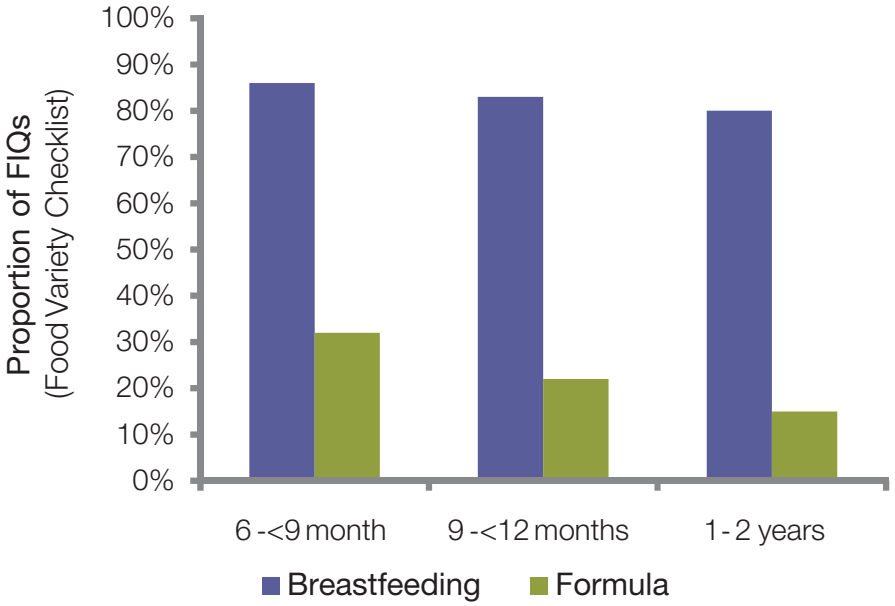

Figure 3
Reported breastfeeding and/or formula feeding

Dietary patterns

A limited variety of foods was consumed, in particular nutrient rich foods.

Three indicators were used to assess the quality of the diet that mothers reported their infants and young children consumed in the previous day: number of meals, food group variety and dietary pattern . These were based on the Australian Dietary Guidelines [21] and WHO indicators [22]. To achieve a 'minimum dietary pattern' infants and young children had to meet both the minimum number of meals and the minimum food group variety.

In 255 of the 381 FIQs (67%), infants and young children did not meet the minimum dietary pattern. Most mothers reported that their infants and young children were eating frequently enough with a median of three meals (range 0-5) for 6-<12 month olds, and four meals (range 0-5) for 1-<2 year olds. The limiting factor in achieving the minimum dietary pattern for infants and young children from 7 months of age was that the variety of food groups reported was poor. The variety of foods consumed by 6 month old infants was not assessed, but most infants were eating at least twice a day.

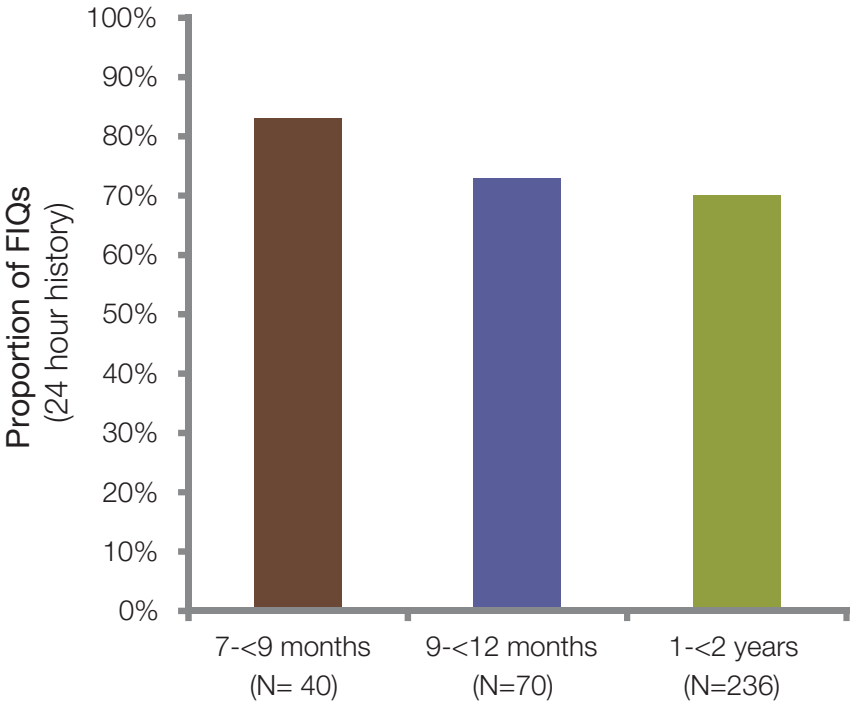

Figure 4
Minimum dietary pattern not met in the previous day

It was most commonly reported that infants and young children ate foods from three food groups: meat & alternatives; breads, cereals and grains; and vegetables & beans. Fruit and cheese and/or yoghurt were infrequently reported. The breads, cereals and grains reported were generally refined (e.g. damper, rice), and potato was the most common vegetable reported.

Iron-rich foods should be introduced first in the complementary feeding process as most infants will deplete their iron stores by six months of age and breast milk is a relatively poor source of iron [23]. Of particular concern, no meat, fish, chicken or eggs were reported in 62% (46/74) of FIQs for 6-<9 month olds and no iron-fortified cereal such as Farex or Weetbix were reported in 42% (31/74).

Specific information on quantities of foods consumed was not collected so an assessment of whether these dietary patterns provided adequate energy cannot be made. Given the lack of diversity in nutrient rich food groups it is highly unlikely that these dietary patterns provided adequate micronutrients, as reflected in the high rates of stunting and anaemia that were found.

4. Minimum meal frequency: ≥ 2 meals/snacks recorded in the previous day for 6-<9 month olds and ≥3 meals/snacks recorded in the previous for 9-<27 month olds. Minimum food group variety: food consumed from at least four food groups in previous day for 7-<13 month olds (meat, fish poultry and eggs; vegetables and legumes; iron fortified cereal; breads, cereals and grains; fruit; and; cheese and yoghurt) and from five food groups consumed in the previous day for 13-24 month olds (breads, cereals and grains; vegetables and legumes; meat, fish poultry and eggs; fruit; dairy; breast milk). Minimum dietary pattern: ≥2 meals for 6 months, and for 7-<27 months, minimum dietary pattern is met if both minimum food group variety and minimum meal frequency was met.

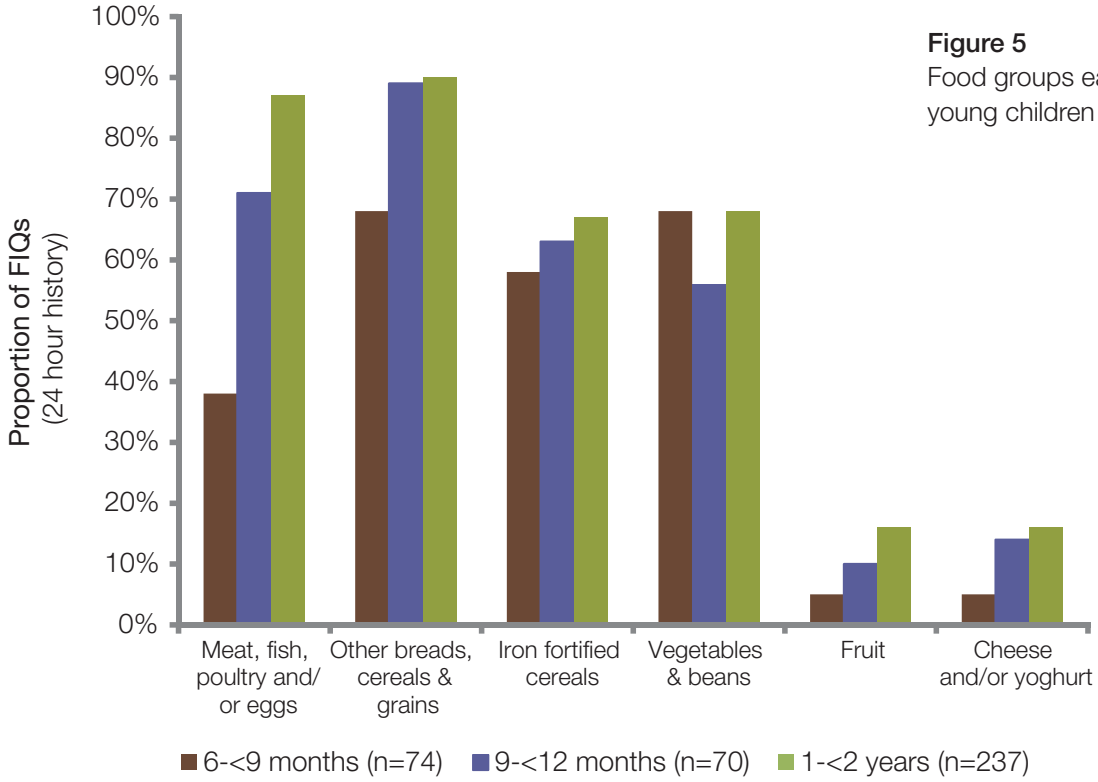

Figure 5
Food groups eaten by infants and young children in the previous day

Traditional foods of Aboriginal Australians were typically rich in nutrients. Bush foods were reported in 16% of the FIQs of 6-24 month olds. This varied between communities and was reported more frequently for young children over 12 months of age than infants.

Mothers reported that their infants and young children ate and drank a variety of 'non-core[5]' foods, in particular juices and sweetened drinks, sweet foods and takeaway foods. These 'non-core' foods were more frequently reported in FIQs of young children rather than infants.

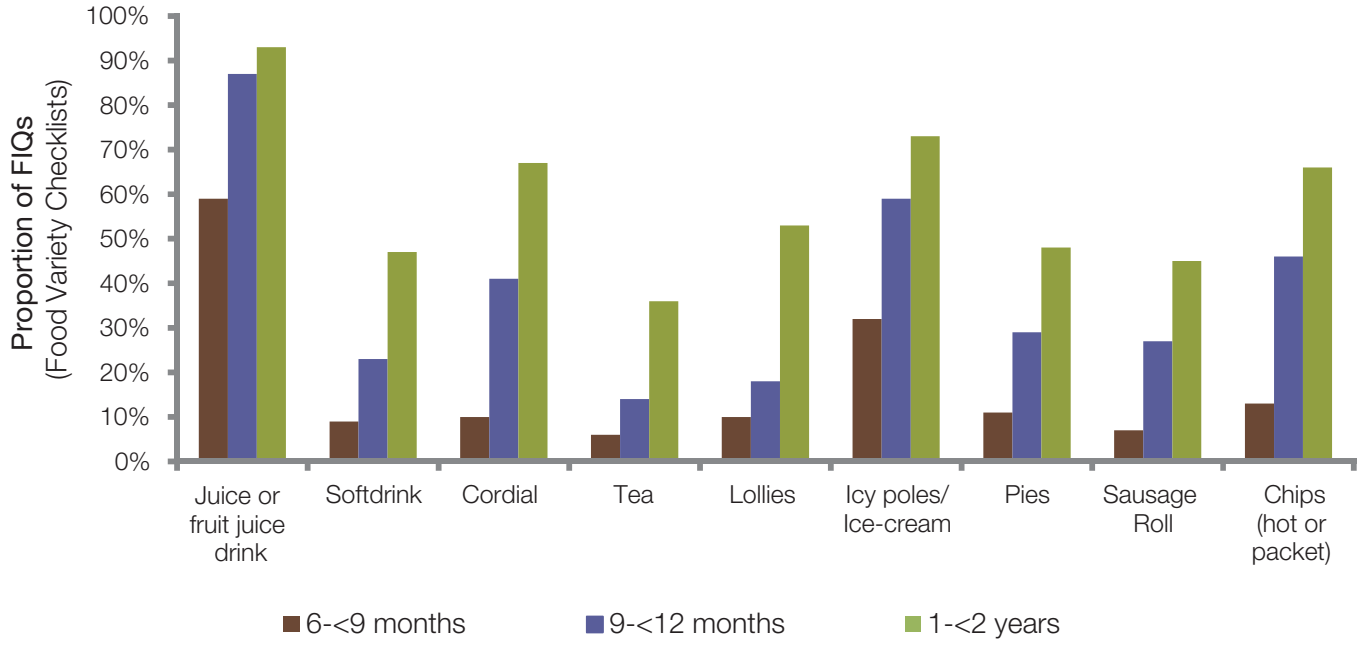

Figure 6
Reported consumption of 'non-core' foods

5. 'Non-core' foods are foods which do not fit within the Five Food Groups recommended in the Australian Dietary Guidelines (21). They are predominantly energy-dense and nutrient poor foods.

Infants and young children are being fed within the context of a community level diet that is nutritionally poor with a high intake of sweetened drinks, tea and white bread and a low intake of fruits, vegetables and protein-rich foods [24].

> Even babies drink Coke. If I drink Coke then my child will copy me. Parents have to eat the right food so their children will. ~ CBW

> The little one cries for ice-cream when we go to the shop. ~ Mother

Families with limited money have a preference for purchasing foods that are 'economical' such as flour and rice which are filling but low in protein and micronutrients [25].

> That flour lasts a long time, but bread goes like water. ~ CBW

There were five instances out of 381 where infants and young children had no food in the previous day. While this failure to provide any food was relatively rare, this reflects a situation of chronic food insecurity where provision of sufficient food for children – much less nutritious food - presents a constant struggle for families.

> It's hard when you have no food in the house, when you run out of money. We go to other families to help out. ~ Mother

> Shop is a long way from [Outstation]. Hard if you don't have a car. I have to ask other families for money or food sometimes. ~ Mother

Implications

- The beneficial breastfeeding practices seen need to be protected, promoted and supported.
- The poor nutritional quality of complementary foods consumed, consistent with poor overall community level diet needs further attention.

Recommendations

- Improve understanding of infant and young child feeding practices in remote communities and further investigate determinants of these feeding practices within Aboriginal and Torres Strait Islander research frameworks.
- Further investigate strategies to improve household food security, selection and distribution in remote northern Australian communities, with a focus on mothers, infants and young children.

4.3 Capacity development

Community Based Workers were important in their communities but experienced difficulties in their role.

A successful outcome of the ECNAPP was developing the capacity of the community-based workforce. It is clear that the CBWs developed skills, knowledge and capabilities as a result of this project.

During the project 34 women from the participating communities were employed as CBWs at some stage. They were involved in all aspects of the project including development of data collection tools and analysis and interpretation of evaluation findings. However, the degree of involvement did vary between CBWs. A core group of 11 women remained engaged during the final evaluation period.

The CBWs experienced a range of difficulties in performing their role. These can be summarised as:

- lack of support from agencies both within and outside the community
- their own perception that they lacked sufficient status in the community's eyes to implement the project
- logistical issues caused by lack of transport and a designated space to work
- their own ill health, family commitments and social pressures.

These difficulties impacted on their work attendance as well as their ability to fulfil their role whilst at work. These challenges are not uncommon in Aboriginal employment in health services [26, 27].

> Really hard to visit people without a car. At Bottom Camp we know all the dogs and they don't chase us, but Top camp has really cheeky dogs. ~ CBW

> We need a proper work area and a vehicle. We kept telling the manager and the nurses and they said we could go with the clinic, but it just didn't work. ~ CBW

Despite these difficulties the CBWs were able to engage successfully with many members of the community and implement a range of educational activities. There was a perception from the community that a longer timeframe was needed to enable information learned from the activities conducted by the CBWs to be consolidated into improved practices.

The CBW role was generally highly regarded by the community members. From the community perspective, the CBW role was increasingly seen as important and valued over time. As the CBWs undertook more training, their own confidence grew and their ability to share information with their communities improved. Older women particularly valued the younger CBWs taking on the role and continuing the work they had been doing.

> Some of them started to understand. Some of them backed down (from criticising us and the project) because they had seen a lot of change with their baby. ~ CBW

> We were there to help them and the kids. We went to courses and made posters. But they (the women in the community) think we are just learning, but we have lots of experience and training. ~ CBW

They go around the camps, it's good that they do it mobile. ~ Mother

The CBWs are really good, you mob bin young and you are talking to young mother. An encouragement for them to be healthy. ~ Mother

The CBWs were employed by the health service and were predominantly co-located within the health centres, however, there was a level of disconnect between the health centre staff and the project. Many health centre staff did not consider the project to be part of core business so they did not spend time learning about the project or engaging with the resources developed by the CBWs. Some health centre staff also reported some scepticism about the value of the program. This disconnect is not surprising given the high workloads of the health centres and the disjuncture between health centre based and community-based programs [28].

Participatory qualitative evaluation methods were used and were valuable in developing research capacity of the CBWs. The insight provided by CBWs in the interpretation of the qualitative findings was invaluable as they had the 'insider' perspective that non-Indigenous project team members did not. The CBWs were able to reflect on whether the stories, interviews and FIQs were 'socially desirable' answers or true reflections of what was occurring.

Developing the capacity of CBWs takes time and resources, however they play a very important role in outreach and community based health promotion. In order to fulfil their role they need adequate and ongoing training and a supportive working environment in order to develop status and prestige in their communities. Allowing time for this to occur 'up front' is important, so that the workers are able to properly and fully implement the program activities.

Implications

- Community Based Workers have an important role in outreach and community based health promotion, but an understanding of how to better support them is required.

Recommendations

- Ensure there is adequate time and resources for training and development of Community Based Workers prior to program implementation.
- Develop supportive workplaces for Community Based Workers.

4.4 Primary health care

Routine child health check/growth assessment and anaemia treatment protocols were poorly adhered to.

Information from routine growth monitoring/well child health checks was used in ECNAPP to minimise additional burden to families participating in the project. Unfortunately only 155 (59%) infants and young children had weight, length/height, and haemoglobin recorded in their health records around the time of enrolment in the project.

Infants and young children with anaemia require adequate treatment to replenish their iron stores. Only 29% of the infants and young children who were anaemic during the project received a full course of iron treatment at the health centre. This highlights the need for improvements in primary health care services, specifically strategies to ensure routine age-specific growth and development checks are undertaken and results are followed up.

ECNAPP utilised 'Sprinkles' in a preventive program, however in international settings 'Sprinkles' has also been used as an alternative to iron syrup in the treatment of anaemia [29, 30].

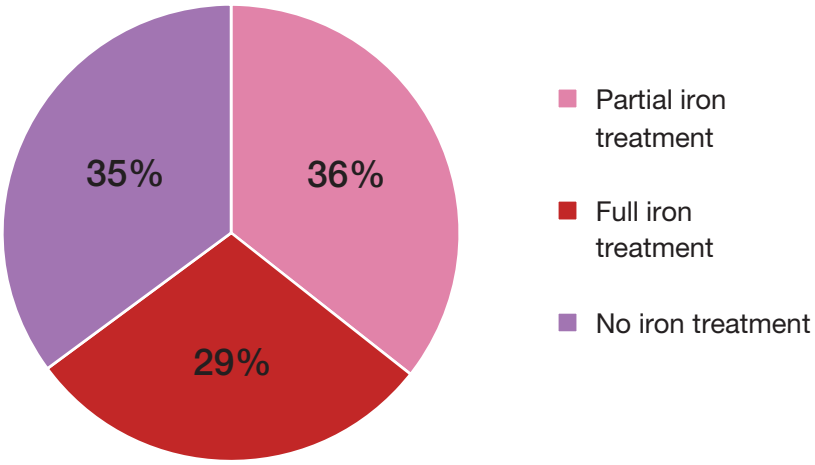

Figure 7
Proportion of anaemic infants and young children who received iron treatment

Implications

- Provision of routine child health checks and growth assessment and adherence to treatment protocols in primary health care needs to be improved.

Recommendations

- Ensure remote primary health care services undertake routine antenatal and child growth and development checks and provide treatment according to relevant protocols. In some settings, protocols for routine checks and/or treatment may need to be revised.

4.5 Multi-micronutrient 'Sprinkles'

'Sprinkles' is single dose sachet of multi-micronutrient powder that can be used to fortify any semi-solid food consumed by infants and young children. Procuring Sprinkles for the project was a major challenge. It took three years to secure a single batch of 'Sprinkles' that could be used under Australian Therapeutic Goods Administration (TGA) regulations. Because of the 2-year shelf life of 'Sprinkles' there was then only a narrow window of opportunity available for the project to be implemented.

Acceptability of 'Sprinkles'

'Sprinkles' and other program activities were accepted by the community

'Sprinkles' were generally well accepted by the community. Mothers and other community members observed positive changes in the health and development of their infants and young children.

When 'Sprinkles' were distributed, most of the time the mother did not report any problems using 'Sprinkles', although there was no documentation about problems for many visits which may be because the CBW did not ask, or the mother did not offer any information. When problems were noted, the main reason for not using 'Sprinkles' was because of lack of food.

Community perception varied about whether they considered 'Sprinkles' needed to be continued beyond the project. Some people were keen to start using 'Sprinkles' again, even for older children. Others felt that bush medicine and good food should now be their strategies to keep their infants and young children's blood strong. Given the poor dietary intakes reported by mothers, substantial changes to infants and young children's diets would be required to provide adequate micronutrients.

> If there are no more 'Sprinkles', we can keep our babies strong with bush tucker and more fruits and vegies. ~ Mother

> I think it ['Sprinkles'] should keep going; it's encouraging for the community, young mothers. I would keep giving it to my kids. ~ Mother

There was an overall perception amongst community members that the project activities broadly, including CBW visits and community-based activities, should be continued.

Distribution of 'Sprinkles'

Adequate distribution of 'Sprinkles' was not achieved for widespread effect

Distribution of 'Sprinkles' was much lower than planned. Home visits were expected to occur every week, however only 35% of these occurred. Most visits did not occur because:

- CBWs were absent for personal and family reasons (eg. illness),
- CBWs were attending training away from the community,
- CBWs did not have transport to make their visits,
- management and administrative reasons, such as problems with CBW employment contracts/pay resulting in inability to work, and
- documentation issues, such as infant or child not included on distribution lists or CBW did not document visit.

Mothers themselves were often away from the community.

Because of the issues described above, in one community, an alternative distribution method was commenced. 'Sprinkles' were posted fortnightly to participating families and any 'Sprinkles' not collected were returned to the Project Officer, however, collecting information on intake as well as providing individual counselling and education about 'Sprinkles' and nutrition needed to be done through other mechanisms.

Most visits (86%) that did occur resulted in 'Sprinkles' distribution. The main reason for not distributing 'Sprinkles' was because the mother was not at home. At 20 visits (0.6%) the parents declined 'Sprinkles'.

Distribution varied between communities. By way of example of this variation, in the first four months of the project the proportion of infants and young children who received at least 60 sachets in each community, varied between none and more than 50%. Further understanding of how to improve coverage is required.

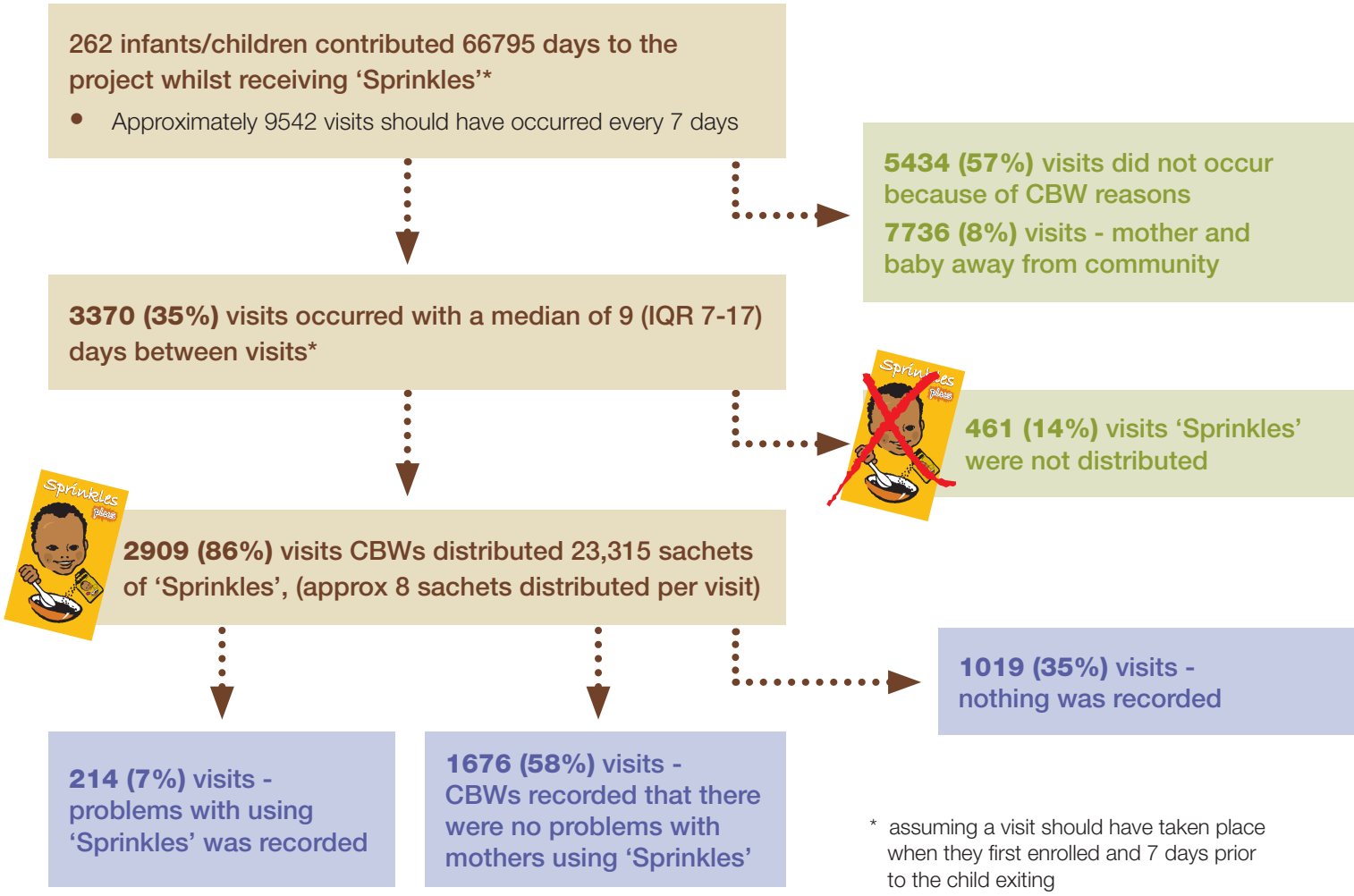

Figure 8
Flow chart of distribution of 'Sprinkles'

Impact of 'Sprinkles' in prevention of anaemia

Adequate supply of 'Sprinkles' maintained Hb levels in non-anaemic children

A dose of at least 60 sachets of 'Sprinkles' taken over a period of up to four months is considered to be 'enough' to prevent anaemia [31]. Of the 204 babies who were in the program for at least four months 76 (37%) received ≥60 sachets during this period. Analysis could only be done on infants/children with adequate 'before and after' Hb measurements. As ECNAPP proposed a preventive approach to anaemia, analysis of the potential impact of Sprinkles on Hb was only done for the 31 infants and young children who started out non-anaemic.

These 31 infants and young children maintained median Hb at 115g/L after four months. There were 51 infants and young children who were not anaemic at baseline and participated for at least four months after consent but did not receive enough 'Sprinkles'. These infants and young children had a significant reduction in their median Hb from 115g/L to 107g/L ($p<0.0001$) after four months. The time between baseline and first Hb after four months for both groups of babies was similar. The difference in change in median Hb between infants and young children who had enough 'Sprinkles' compared to the infants and young children who did not have enough 'Sprinkles' did not reach significance ($p=0.09$).

If adequate distribution can be achieved, it is likely that providing 'Sprinkles' or other such multi-micronutrient supplementation will maintain the haemoglobin levels of non-anaemic infants and young children.

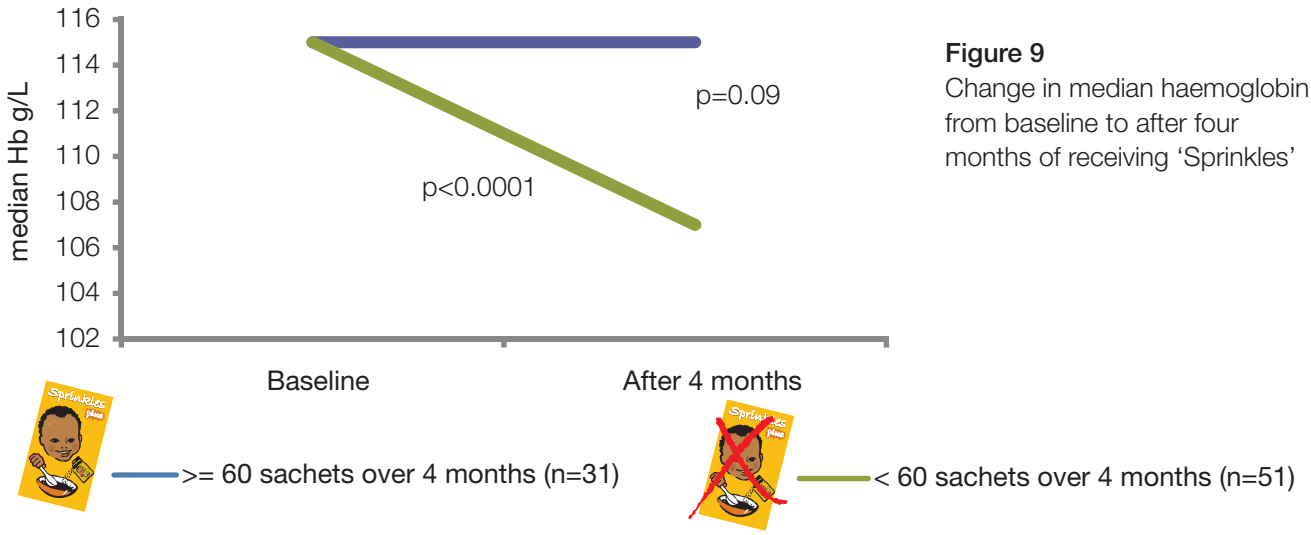

Figure 9
Change in median haemoglobin from baseline to after four months of receiving 'Sprinkles'

Implications

- If adequate distribution can be achieved, it is likely that providing 'Sprinkles' or other multi-micronutrient supplementation will maintain the haemoglobin levels within the normal range of infants and young children without anaemia.
- To improve distribution of 'Sprinkles', or other multi-micronutrient supplement, further understanding of the enablers to achieving adequate distribution and exploration of additional strategies to increase distribution is required.

Recommendations

- Explore how to improve distribution of 'Sprinkles' or similar multi-micronutrient supplements, including additional strategies for distribution.

4.6 Nutrition counselling and education

Implementation of nutrition counselling and education was limited

CBWs developed key messages that were specific to the needs of their community. These messages were promoted at their visits with mothers, as well as CBWs own tools for education and promotion that used language and concepts they understood and could explain to mothers.

Information provided to mothers was mainly about how to use, store and access 'Sprinkles' (35% of visits). Nutrition information was provided at 12% of visits. CBWs also offered general encouragement and praise to the mother. There was no information recorded about what information was provided for 40% of visits highlighting the issues of record keeping and data-entry.

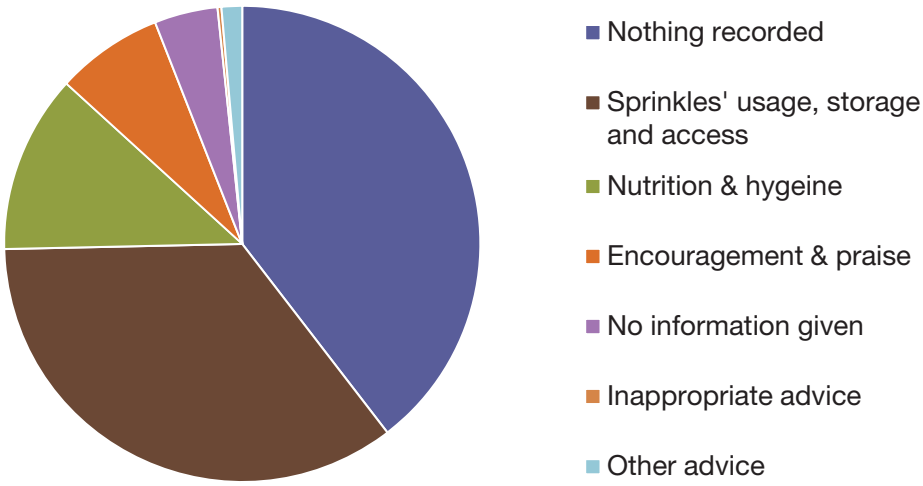

Figure 10
Type of information/advice provided to mothers by CBWs at home visits

Individual nutrition counselling and education at home visits was not the only opportunity for nutrition education. Mothers groups, cooking classes and other group activities were also conducted. Whilst the overall number of such activities was limited (a total of 51 across the six communities), mothers and other community members reported that they enjoyed the activities and they remembered the content.

> I have leant lots and went to education under the tamarind tree and at the safe house. ~ Mother

> Going to the shop with CBW worker and looking at which foods are good for kid, also go out bush fishing. ~ Mother

> The cooking was really good, encourage them to cook up healthy meals for the baby. I did learn about healthy food, my family too. Simple things but healthy for family too. ~ Mother

However some mothers also reported difficulties participating due to lack of transport, lack of child-care and other commitments.

Organising and facilitating the group activities was challenging for the CBWs and generally relied on support from visiting project team members. Organising a suitable venue and rallying community involvement was time-consuming, particularly as the mothers had to deal with many competing priorities.

> That thing that make it hard were that sometimes they didn't turn up for sessions - only when there is food they came. ~ CBW

> Sometimes it was hard in cooking class because some mother wouldn't participate, so we had to do it all ourselves, all the chopping. The mother wouldn't help. ~ CBW

However these activities were perceived as important by some community members and should be continued.

> I reckon that they need more 'Sprinkles'. People haven't learnt enough about cooking food for infants and young children. Not enough people go to the cooking classes. ~ Female Elder

The timeframe of the project did not allow for CBWs to be fully trained in infant and young child feeding counselling prior to commencing the project. In the early phases of project implementation at each community, the focus was largely on navigating workplace administrative processes and training and development of processes for 'Sprinkles' distribution, hence time spent on nutrition counselling training was often limited.

The relatively low coverage of individual nutrition counselling suggests strategies for improving provision of one-to-one nutrition education and counselling need further consideration. In some settings, implementing a structured sequence for giving information to mothers about nutrition could facilitate 'compliance' with promoting key messages [32, 33].

Development of Talking about Feeding Babies and Little Kids

Talking about Feeding Babies and Little Kids (TFBLK): a counselling course for community based workers supporting families with infants and young children 0-2 years old was developed as an output of the Early Childhood Nutrition and Anaemia Prevention project. TFBLK was based on the Infant and Young Child Feeding Counselling: An Integrated Course, a course developed by WHO for countries globally to adapt and refine to their context with the aim of improving optimal feeding practices for infants and young children worldwide. The adaptation of the course was ongoing over the duration of the project with input from the CBWs themselves and from direct feedback and learning from the training sessions that occurred in the pilot communities.

Ten members of the ECNAPP project teams were trained as Trainers in the WHO course and have delivered the course to over 100 health practitioners including CBWs, Aboriginal health workers, nurses/midwives, nutritionists/dietitians, and health promotion and family support workers from NT, WA and Qld. Drawing on participant feedback and expertise of the Trainers, the course was redeveloped to meet the identified needs of Trainers, incorporate foundational information about nutrients and the body, be more context-specific and incorporate more practical activities for CBWs to do with mothers in group and individual counselling sessions.

The first edition of the TFBLK training kit was produced in May 2012. Since then, 47 health practitioners have participated in the course, training to be Trainers, and have delivered the course to CBWs in communities across northern Australia.

For future sustainable implementation of TFBLK, Menzies School of Health Research will take a lead role in the training of Trainers and ensuring TFBLK continues to be based on the best available evidence and has Vocational Education and Training (VET) accreditation.

Recommendations

- Further evaluate the impact of the Talking about Feeding Babies and Little Kids program on the skills and capabilities in nutrition counselling and education of health and community service workers, community capacity, and outcomes for infants and young children.

5 Conclusion

A program of preventive multi-micronutrient supplementation, peer-counselling and nutrition promotion was piloted in six remote northern Australian Aboriginal communities. Adequate distribution of 'Sprinkles' was not achieved for all infants and young children. Many infants were also anaemic prior to commencing in the project, and were not adequately treated through routine primary health care. Structural issues relating to CBW employment, mentoring, support and resources were the main challenges in 'Sprinkles' distribution. Individual nutrition counselling was limited, although group-based and community promotion activities were also undertaken. The nutrition training program for CBWs was not fully developed until after project completion which impacted on the training of CBWs.

An important unexpected finding was the very high rate of anaemia at 6 months of age. Consequently a preventive approach commencing at 6 months of age is insufficient to reduce overall anaemia prevalence. Integrated strategies addressing maternal nutrition (pre-pregnancy and pregnancy) as well as infant and young child nutrition and other causes of anaemia are required.

6 Key recommendations

1 Priorities for health services are:

1.1 To determine if the high rates of early onset anaemia found in ENCAPP are widespread across remote communities in northern Australia, and take action to address the findings, and

1.2 To ensure remote primary health care services undertake routine antenatal and child growth and development checks, and provide treatment according to relevant protocols. Protocols for routine checks and/or treatment may need to be revised in some settings.

2 Considerations for community programs are:

2.1 To ensure there is adequate time and resources for training and development of Community Based Workers prior to program implementation, and

2.2 To develop supportive workplaces for Community Based Workers.

3 Areas for further research include:

3.1 Investigate the relative contribution of micronutrient status and other determinants of anaemia in Aboriginal infants and young children in remote northern Australian communities,

3.2 Investigate strategies to address the determinants of anaemia and effectively prevent anaemia and iron deficiency in Aboriginal infants and young children in remote northern Australian communities,

3.3 Explore how to improve the distribution of 'Sprinkles' or similar multi-micronutrient supplements, including additional strategies for distribution,

3.4 Improve the understanding of infant and young child feeding practices in remote northern Australian communities and further investigate the determinants of these feeding practices within Aboriginal research frameworks,

3.5 Further investigate strategies to improve household food security, selection and distribution in remote northern Australian communities, with a focus on mothers, infants and young children, and

3.6 Further evaluate the impact of the Talking about Feeding Babies and Little Kids program on the skills and capabilities in nutrition counselling and education of health and community service workers, community capacity, and outcomes for infants and young children.

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8 Appendix 1: Timeline of project activities

Key milestones

2005	October - April 2006	Stakeholders propose piloting 'Sprinkles' in northern Australia
2006	April	Project Steering Committee established
	April - July 2009	Heinz seeks procurement of 'Sprinkles' through international suppliers
2007	January - July	Formative research in eight NT communities
2008	April	Top End Ethics Approval (NT)
	April - January 2010	Heinz seeks domestic production of 'Sprinkles'
	May	Central Australia Ethics Approval (NT)
2009	August	WHO Infant and Young Child Feeding Counselling Course at Darwin
	December	Program Logic/Outcome Mapping workshop with partners
2010	February	Adapted Infant and Young Child Feeding Counselling training at Balgo
	February	'Sprinkles' registered with Therapeutic Goods Administration
	May	'Sprinkles' produced and despatched to NT
	May	Develop data collection tools with project team at Ngukurr Project commences at Ngukurr
	July	Update data collection tools, Study Protocol and evaluation methodology
	June	WA Ethics Approval
	August	Adapted Infant Feeding and Young Child Counselling training at Katherine, Cairns and Darwin
	August	Project commences at Borroloola
	September	Project commences at Jilkminggan
	October	Adapted Infant and Young Child Feeding Counselling training at Alice Springs
	November	Project commences at Ti Tree & Pmara Jutunta
2011	March	Project commences at Engawala
	March	Qld Ethics Approval
	June	Project commences at Balgo
	July	Mid Term Project Meeting at Batchelor Introductory training in qualitative evaluation and Most Significant Change (MSC) MSC Story collection with project teams
	July	Project commences at Kowanyama
	August	Project activities cease at Engawala due to clinic closure and CBW resignation
	November	MSC Story collection at Ngukurr, Ti Tree & Pmara Jutunta
	December	Withdraw Engawala from project
2012	May	'Sprinkles' distribution ceases at all communities
	May	Publication of Talking about Feeding Babies and Little Kids (TFBLK) trainers kits
	June	Training of Trainers for TFBLK at Darwin
	July - November	Community based qualitative interviews
	August	Training of Trainers for TFBLK at Alice Springs
	August	Qualitative Evaluation Training Workshop at Darwin
	August - March 2013	Analyse quantitative data
	February	Training of Trainers for TFBLK at Alice Springs
	November	Data Analysis, Interpretation and Reporting Workshop at Darwin
	December - April 2013	Further analysis of quantitative and qualitative data

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