Article

Feasibility of a novel participatory multi-sector continuous improvement approach to enhance food security in remote Indigenous Australian communities

J. Brimblecombe[a,*], R. Bailie[d], C. van den Boogaard[a], B. Wood[a], SC. Liberato[a], M. Ferguson[a], J. Coveney[a,b], R. Jaenke[a], J. Ritchie[a,c]

[a] Wellbeing and Preventable Chronic Disease Division, Menzies School of Health Research, Royal Hospital Campus, Rocklands Dr, Tiwi NT 0810, Australia
[b] School of Health Sciences, Faculty of Medicine, Nursing and Health Sciences, Flinders University Sturt Road, Bedford Park, South Australia 5042, Australia
[c] School of Public Health and Community Medicine, University of New South Wales, NSW, Australia
[d] University Centre for Rural Health, University of Sydney, North Coast, Lismore 2480, Australia

ABSTRACT

Background: Food insecurity underlies and compounds many of the development issues faced by remote Indigenous communities in Australia. Multi-sector approaches offer promise to improve food security. We assessed the feasibility of a novel multi-sector approach to enhance community food security in remote Indigenous Australia.

Method: A longitudinal comparative multi-site case study, the Good Food Systems Good Food for All Project, was conducted (2009–2013) with four Aboriginal communities. Continuous improvement meetings were held in each community. Data from project documents and store sales were used to assess feasibility according to engagement, uptake and sustainability of action, and impact on community diet, as well as identifying conditions facilitating or hindering these.

Results: Engagement was established where: the community perceived a need for the approach; where trust was developed between the community and facilitators; where there was community stability; and where flexibility was applied in the timing of meetings. The approach enabled stakeholders in each community to collectively appraise the community food system and plan action. Actions that could be directly implemented within available resources resulted from developing collaborative capacity. Actions requiring advocacy, multi-sectoral involvement, commitment or further resources were less frequently used. Positive shifts in community diet were associated with key areas where actions were implemented.

Conclusion: A multi-sector participatory approach seeking continuous improvement engaged committed Aboriginal and non-Aboriginal stakeholders and was shown to have potential to shift community diet. Provision of clear mechanisms to link this approach with higher level policy and decision-making structures, clarity of roles and responsibilities, and processes to prioritise and communicate actions across sectors should further strengthen capacity for food security improvement. Integrating this approach enabling local decision-making into community governance structures with adequate resourcing is an imperative.

Introduction

Food insecurity is a significant health and well-being issue for Aboriginal Australians and Torres Strait Islander people. The 2012/2013 Australian Aboriginal and Torres Strait Islander health survey reported that 22% of adults were living in a household that in the last 12 months had run out of food and had not been able to buy more (ABS, 2015). This contrasts with 3.6% reported for non-Indigenous Australians (ABS, 2015). The failure to attain food security for all Aboriginal and Torres Strait Islander Australians contributes to an extremely high prevalence of nutrition-related disease (ABS, 2013; AIHW, 2011).

Food security is underpinned by: (i) food availability, where sufficient quantities of nutritious food are available on a consistent basis; (ii) food access, where there are sufficient resources to obtain appropriate foods for a nutritious diet; (iii) food use, where there is appropriate use of food, based on knowledge of basic nutrition and care, as well as adequate water and sanitation; and, (iv) stability of these three

dimensions over time (FAO, 2008). The optimal functioning of these three dimensions results in a situation of food security "where all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 2008). Ending hunger and achieving food security is the 2nd global sustainable development goal adopted in 2015 by the UN General Assembly (United Nations, 2017).

Natural, cultural, social and built environments all influence food security (Wood & McDowell, 2009). Consequently, modifying these environments and considering all components of the food system to support healthy eating are likely to have more potential to result in positive and sustained change (Swinburn, Egger & Raza, 1999). A food system, for the purpose of this paper, includes all processes and infrastructure involved in feeding a population from food production and processing, food distribution through to food consumption and waste disposal (AIHW, 2012).

The effectiveness of a multi-sector approach in building a healthy eating environment is evident from the literature (Rogers, Ferguson, Ritchie, Van Den Boogaard & Brimblecombe, 2016; Rowley et al., 2000; Waters et al., 2011). Success has been shown among community-based nutrition programs conducted with Aboriginal and Torres Strait Islander communities that have involved multiple strategies, worked with multiple sectors and agencies and placed community control and ownership central to program development and implementation (Black, 2007). The Australian Government food security strategy for remote Aboriginal and Torres Strait Islander communities acknowledges these critical elements and proposes that "improving food security and turning around the long-standing poor health outcomes for Indigenous people in remote Indigenous communities will require a multi-faceted and coordinated ongoing approach from all levels of government, Indigenous people and the non-government and private sectors to develop and implement effective and targeted actions" [(COAG, 2009); p 5]. However evidence is lacking on the actual processes that might be undertaken to achieve and sustain such a desired multi-faceted and coordinated approach and particularly lacking on one where Indigenous people are central to decision-making (Whelan et al., 2015). Multi-sector collaborations are difficult to establish and sustain in any setting (Whelan et al., 2015; Pettman et al., 2015; Kreuter, Lezin & Young, 2000).

To address this problem within the health service sector in Indigenous Australia, a participatory action learning model for continuous quality improvement (CQI) was successfully implemented and sustained, demonstrating increasing quality of health care to communities (Bailie, Si, O'Donoghue & Dowden, 2007; Bailie, Matthews, Brands & Schierhout, 2013). The approach involves a cyclical planning and evaluation CQI process where health service staff members annually assess their performance against best practice and clinical outcomes, and develop a plan for improvement (Bailie et al., 2007). Such decision-making processes that combine best available evidence and local knowledge to develop a course of action and impact on how people think and act, are receiving increasing attention (Swinburn, Gill & Kumanyika, 2005; Bushe & Marshak, 2009; Edvardsson et al., 2012). The siloed delivery of services in remote Indigenous communities has often resulted in little time invested in planning, reflection and evaluation across sectors, and in building community residents' capacity in these areas (Brimblecombe et al., 2015; Cargo et al., 2011). This has minimised opportunity for collective learning on how different parts of the system respond to intervention and relevant responses to identified issues (Brimblecombe et al., 2015).

To facilitate collective learning for system change and provide a platform for local decision-making, we hypothesised that such a continuous improvement approach could be developed and applied in remote Indigenous communities to improve diet and food security. We rationalised that local stakeholders, engaged in continuous improvement activities, would be enabled to improve practice in their area of food security influence which in turn would incrementally strengthen the local food system over time and in the long-term lead to improved food security and community diet as measured by store sales data.

Thus, through the Good Food Systems Good Food for All Project (GFS project), we aimed to engage and work with existing governance structures or to establish a new multi-sector food interest group (a local Good Food Group) in each of four remote communities, comprising both Aboriginal and Torres Strait Islander and non-Indigenous stakeholders with an interest in building a healthy and sustainable food system. With these local groups, we aimed to develop and test the feasibility of a monitoring and evaluation learning approach to improve the capacity of Aboriginal and Torres Strait Islander communities, and their various service providers to influence the food system to increase availability, affordability and accessibility of healthy food.

We have previously reported that the approach developed with these four communities was found to be acceptable, useful, and of benefit to the communities themselves (Rogers et al., 2016). Stakeholders perceived that availability and accessibility of healthy food and improvements in retail practice resulted from (i) creating a supportive environment; (ii) bringing people together; and, (iii) increasing knowledge and capacity (Rogers et al., 2016).

In line with the original aims of the GFS project, the aim of this paper is to report on the feasibility of the approach, according to engagement, uptake and sustainability of actions, impact on community level diet, and the conditions facilitating or hindering these. The ultimate purpose of this paper is to provide insights on multi-sector approaches to food systems and on the potential use of such a multi-sector participatory approach with other remote Aboriginal and Torres Strait Islander communities across Australia.

Methods

The GFS project

The GFS project was a comparative longitudinal multi-site case study (Yin, 2003) that documented the evolving processes supported by the project over five years (2009–2013), from community consultation to end of project community feedback visits, in four selected communities, to describe development and assess feasibility of the project's approach.

Community selection

Communities were selected to represent variations in remoteness, geographic location and size. Further selection criteria included: (1) presence of community leader support for addressing food system improvements; (2) previous record of collaboration between local government, health agencies and other community organisations on issues/projects; (3) adequate point-of-sale scanning equipment in the main community store. Six communities were identified with four accepting the invitation to participate. These four ranged in size from 250 to 2000 residents with the majority ($>$ 95%) identifying as Indigenous.

Good food groups

Each consenting community either identified an existing structure to work with or established a new local Good Food Group, and recruited a community-based Aboriginal project coordinator (the community coordinator). The community coordinator's role was to guide the research team in their interactions with each of the communities, contribute to the development of the GFS approach and data collection tools, encourage stakeholder engagement, assist with data collection and increasingly co-facilitate the GFS meetings with a member of the urban-based project team (the external facilitator(s)). We aimed to have mostly Aboriginal people participating in the Good Food Groups although membership remained open to anyone living locally or providing a food-related service to the community. Thus, depending on the
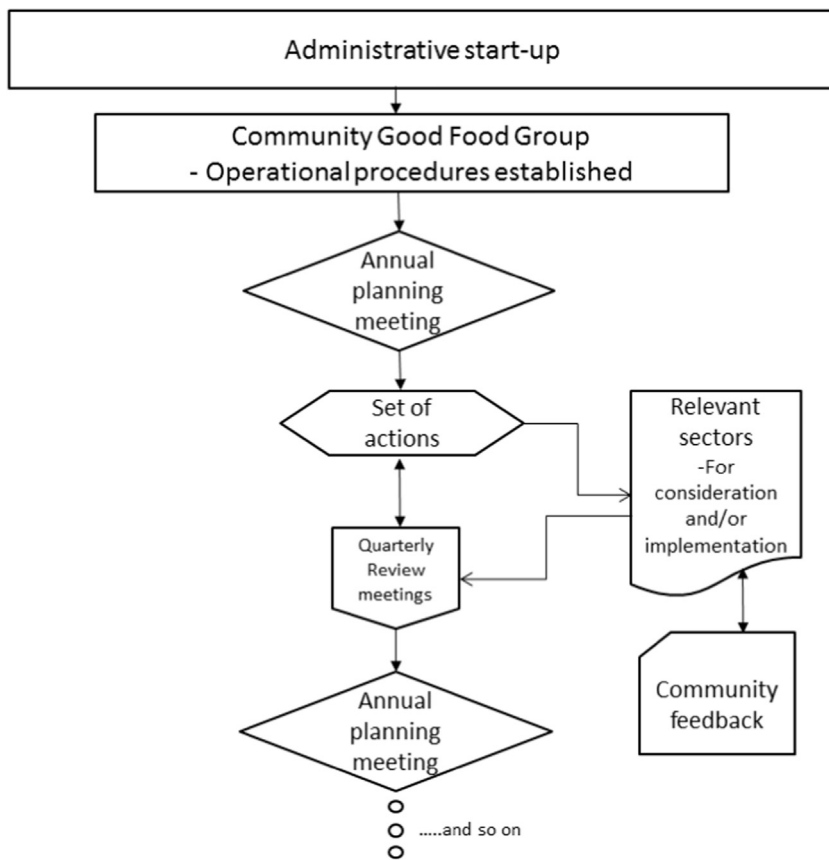
Fig. 1. The Good Food Systems approach flow diagram in each of the four communities.

Box 1
The GFS multi-sector participatory continuous improvement approach.

At the annual planning meetings, participatory and structured methods facilitated by the researcher and/or community coordinator were used to:

- create a vision for the community food system
- map the food system and identify food-related activities, services and programs supported in the community;
- appraise the performance of these against a set of food system practice goals, using the purposely designed Good Food Planning Tool (GFPT);
- consider current food purchasing using the store sales data reports;
- determine an action plan.

   Subsequent quarterly two to three-hour review meetings were held in each community to:

- collectively update on food-related activities/ events occurring in the community;
- reflect on the status of prioritised actions; and,
- consider food purchasing trends and influencing factors.

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community, participants were stakeholders drawn from the store board and management, the health service, the school, the aged-care service, the local government shire service, and those holding other relevant government positions. Stakeholders who resided outside of the community mostly included retail support staff, health professionals and government officers.

The GFS multi-sector participatory continuous improvement approach

   On a Good Food Group forming, we facilitated subsequent regular meetings in each community (Fig. 1). Continuous improvement approaches were set up for stakeholders to assess together the extent to which appropriate actions were taken in moving towards agreed goals Thus each Good Food Group was encouraged to meet together for one

annual planning meeting and three quarterly review meetings each year (i.e., one continuous improvement cycle per year) during the project's four action years (2010–2013). At the annual planning meetings held over two half days, Groups were supported to appraise their community food system using the Good Food Planning Tool (Brimblecombe et al., 2015), an innovative instrument developed and refined over the course of the project. The tool encompasses five domains of the remote Australian Aboriginal community food system and 28 activity areas. Its development has been described elsewhere (Brimblecombe et al., 2015), but in brief, its components were informed by the combination of best available evidence and local knowledge. The five food system domains are i. Leadership and partnerships; ii. Traditional food and local food production; iii. Food businesses; iv. Buildings, public places and transport; v. Community and services (Brimblecombe et al., 2014a).

Through this appraisal process, each group prioritised a set of actions. Progress with actions was reviewed on several occasions over the course of each year in Good Food Group meetings, together with store sales data reports that provided information on trends in food and drink sales from the primary community store. Meeting minutes were transformed into reports with graphics and images and circulated to Good Food Group attendees. The GFS multi-sector participatory continuous improvement approach is detailed in Box 1.

In addition to the meetings that occurred in each community (see Fig. 1), four urban-based workshops were convened over the study period. Community coordinators and other invited stakeholders (including Aboriginal community members, elders, store managers and staff, service providers, policy-makers and academics) were brought together to assess overall project progress and to refine the evolving GFS continuous improvement approach and data collection and feedback tools, including the GFPT, the store sales reports and a tool for the Good Food Groups to reflect on their capacity development (Brimblecombe et al., 2014b).

Store sales data reports

Reports showing monthly sales of fruit and vegetables, confectionery and soft drinks were developed with input from the community coordinators. As the community store was the primary food source in the participating communities, the sales data provided an objective measure of community diet (Brimblecombe, Liddle & O'Dea, 2012). Sales of fruit and vegetables and soft drinks (sugar-sweetened) were monitored, as fruit and vegetable intakes in the remote Indigenous Australian context are known to be low and soft drink intake high (Brimblecombe et al., 2012). Confectionery sales were monitored due to concern raised in one community of high consumption of these among children. These reports were provided to and discussed with the store manager prior to wider dissemination.

Assessment of feasibility - data collection and analysis

Documentation from all project activity including Good Food Group meeting minutes and feedback reports, urban-based workshop reports, site reports, journal notes, research team meeting minutes and store sales reports were used to assess feasibility according to engagement, uptake and sustainability of action, impact on community diet, and to identify conditions facilitating or hindering these.

Engagement

Five measures were used to assess engagement: (a) length of community consultation; (b) number of meetings that occurred in each community against the planned three full continuous improvement cycles; (c) representation of the spectrum of potential stakeholders relevant to the community's food system; (d) participation of community coordinators; and, (e) level of Indigenous representation in meetings. Data pertaining to these were extracted from meeting minutes, entered into an excel spreadsheet, independently crosschecked by two researchers, and tabulated.

Uptake and sustainability of action

All Good Food Group meeting minutes and feedback reports were uploaded into NVivo software (QSR International Versions 10). All actions that were identified by the Good Food Groups were coded by their matching food system domain and further coded as identified, followed-up (i.e., discussed in a subsequent Good Food Group meeting) or implemented. Actions, by domain, were then listed for each community in tables as implemented or not implemented, with the time taken from identified to implemented shown.

Impact on community diet

For each community, relative month-to-month sales (compared with total food and drink sales) of fruit, vegetable, confectionery, bottled water and sugar sweetened soft drink (regular soft drink), were graphically presented and a line of best fit overlaid in the period immediately preceding GFS activity and in the last six months of the project in each community. All data were included in the analysis including sales data for the months where it was observed that sales were atypically high or low due to population movement (such as a sports carnival or funeral) or unforeseen events (such as breakdown of a store fruit and vegetable chiller).

Facilitating or hindering conditions

Using NVivo, all text data were reviewed and coded according to type of project activity (e.g., annual/ review meeting, community visit for consultation, or phone call with community coordinator) and further coded as an 'enabler', 'positive remark', 'barrier' or 'negative remark'. This coded information was then tabulated by community and analysed to identify conditions facilitating or hindering engagement, uptake and sustainability of actions, and impact on community diet.

Ethics

Ethics approval for all aspects of the Project was attained from the Human Research Ethics Committee (HREC) of the Northern Territory Department of Health and Menzies School of Health Research (ref. HREC 09/07), Cairns and Hinterland Health Service District Ethics Committee (ref. HREC/10/QCH/71–678) and the Central Australian HREC (ref 20090202). Signed partnership agreements were negotiated with participating organisations and communities.

Results

Two of the four communities (B & C) agreed to establish a new Good Food Group. Community A nominated the existing store board as the appropriate authority for decision-making on food system issues and with time, invited other sectors to participate in annual planning meetings. In community D, a one-off planning meeting was held with local stakeholders but we were not successful in establishing a Good Food Group. The community instead contributed to the development of the multi-sector approach through supporting the participation of members in the urban-based meetings, and in the one-off annual planning meeting.

Engagement

Engagement of stakeholders in the GFS activities was demonstrated in three of the four study communities where a diverse group of stakeholders, including local Indigenous people and representatives of various community sectors, met on a regular basis over the course of the project (Supplementary Tables 1 to 3). Conditions that facilitated engagement included the community's perceived need for the approach, the trust developed between the community and facilitators, the stability of the community, and flexibility in the timing of project activities to accommodate other commitments and events.

Length of community consultation

The first annual planning meetings occurred within twelve months of the first visit to the community in communities A-C as expected and only after a drawn out project start-up period of 17 months in community D. Project start-up was facilitated by there being pre-existing relationships between the research team and the community and/or the project aims clearly aligning with those of the community's. For example, in community B, as the project was seen to align with the goal of establishing a store committee, several community leaders expedited community consultation and encouraged the participation of other community leaders in the first annual planning meeting. This

involvement of community leaders indicated to the community the importance of participation. Similarly, in community C, the research team had previously worked with the community in addressing food security-related issues and had strong existing relationships with this community. In community D on the other hand, the first and only annual planning meeting did not occur until well into the second year of consultation. This community, in contrast to the other three, had an inter-agency group with a majority representation of Indigenous community members that met regularly. This group however did not have a focus on food security. Time was thus inadequate to build the necessary trust and relationships for the project's aims to be met.

Number of meetings that occurred

Three of the four communities completed the three intended annual planning meetings and most of the intended follow-up review meetings. Flexibility was needed in the scheduling of GFS activities. For instance, postponement of GFS activities in all four communities occurred on many occasions due to funeral ceremonies,[1] extreme weather conditions, unavailability of the community coordinators or sector representatives at times due to other commitments. Unavoidable changes in project staffing also interfered with the timing of some meetings. In one community, prolonged road closure due to unusual heavy rains and flooding in combination with community instability prevented the team visiting for more than 12 months, although when possible, we maintained telephone contact with the community co-ordinator and were then able to resume GFS activity once the opportunity arose.

Representation of the spectrum of potential stakeholders relevant to the community's food system

On the whole, meeting records showed good attendance by stakeholders at Good Food Group meetings. Nearly all services and organisations in each of the communities who had a role in the food system attended at least one meeting, with most attendees residing in the communities. We found that the building of trust over time with the different sectors in the community was the catalyst to a wide representation of different sectors participating in the Good Food Groups and to building collaborative capacity. For example, in one community, towards the end of the project, the managers of two competing community food businesses joined together to commit to remove large unit soft drinks from their outlets. It was at times difficult to maintain consistency in participation of non-Indigenous stakeholders due to their high turnover, a pervasive characteristic of the remote community workforce that we were unable to influence.

Participation of community coordinators

In three communities, the community coordinators recruited in the first year of the project supported the project through to its completion. In all four communities, the project team maintained regular phone contact with the community coordinators and provided opportunities for on-the-job training where learning occurred "both-ways" – that is from Indigenous to non-Indigenous project members and in reverse. As the confidence of the community coordinators developed and the processes became more familiar to them, they took on more responsibility in facilitating meetings, interpreting and translating information, collecting data and providing feedback on the project to the community. In all communities, the knowledge of the community coordinators about their community's authority structures, practices and cultural protocols, the kin relationships and communication protocols between people, and the lived experience of food issues faced by the community was a key facilitator for engagement. The community coordinators also understood the processes that were needed to effectively get traction and commitment for actions identified by the Good Food Groups that were

beyond the Group's direct influence in addressing food security. They were the ones who stressed that recommendations arising from the Good Food Group be both endorsed by the community's authority structures and be made transparent to the wider community through visiting and discussing with family groups. We found that it was important that the community coordinator be hosted by an organisation in the community to assist with office facilities and communication to the urban-based project team and found that agencies in the community were willing to provide this support.

Level of indigenous representation in meetings

In the three communities that had regular meetings over half of those who regularly attended were Indigenous. Each community appeared to differ with respect to its expectations regarding Indigenous participation. For instance, Indigenous stakeholders in two communities expressed a preference for mostly Indigenous participation; whereas the intent of the community coordinator in another community, a very small community compared to the others, was to link the non-Indigenous managers of specifically the health, youth and education sectors with the all-Indigenous store board, and to strengthen the relationship between store boards and store management. The number of Indigenous attendees waned temporarily towards the end of the project in communities A and B suggesting that participation renewal may need to be considered by the Good Food Groups.

All communities shared similar views on the value of the involvement of elders and traditional owners. Whilst attendance of meetings by these persons was not necessarily expected, the community coordinators and other Indigenous participants often brought to the group's attention the importance of communication with these persons and the value of their endorsement of the GFS project overall.

Uptake and sustainability of action

In each of the three communities where a Good Food Group regularly met, most actions identified were in the domains of food businesses, followed by community and services, and leadership and partnerships (Table 1 and Supplementary Table 4). Fewer actions were identified in the domains of traditional food and local food production, and buildings, public places and transport. Approximately one-third of the actions identified by the three Good Food Groups were implemented. In two communities, where implementation was highest for the food businesses domain, this focus in one appeared due to the influence of the store board members. The other community chose to focus solely on the food businesses domain as a starting point before broadening to other domains requiring wider participation of concerned key personnel. Implementation in community B was highest for the domains of strong leadership and partnerships, and traditional foods and local food production. This is likely due a number of the Group's participants being in leadership positions in the community and there being a community garden.

Actions that were implemented in general appeared to be those that Good Food Group attendees committed to and were able to directly influence (such as the store manager re-locating confectionery to be less prominent; the store manager increasing the range of artificially sweetened drinks; the community coordinator involved in the youth program seeking support for more bush trips on to country; and the community coordinator presenting Good Food Group recommendations to the community board), or where implementation may have occurred regardless of the presence of the Good Food Group (such as the in-store labelling of fruit, vegetables and water as healthy, instigated by a non-government organisation).

Actions that were not implemented tended to be those that required: (i) the involvement of multiple sectors in the community (such as the implementation of a healthy food policy for all community events/ meetings); (ii) the Good Food Group to play an advocacy role (such as advocating to the respective government authorities for consideration

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[1] Funeral ceremonies in Indigenous Australia can occur over many days/ weeks with kinship obligations taking precedence over other activity

Table 1

Summary of actions identified and implemented by three of the community Good Food Groups (A, B, C)[a], by five food system domain.

Leadership and Partnerships	Implemented (Yes/No)	Community
Public display and community dissemination of store sales reports; Good Food Group (GFG) conduct food environment monitoring activities	Y	B
Feedback of GFG recommendations to other community agencies and community authorities	Y	C
Invite and encourage wider representation of relevant community sectors in GFG	Y	B, C
Clarity on purpose of GFG among relevant community sectors and promotion of purpose and progress of GFG across the community	Y	C
GFG advocate for i) reinstatement of new store committee; ii) wet season subsidy to reduce cost of healthy food; iii) Centrelink to inform clients of ALPA food card option to secure money for food; iv) other agencies to promote healthy eating; v) raise concerns with government about Basics card; vi) new store [B], including a community petition	Y	B
GFG provide nutrition training to members and meet with parents to discuss importance of discouraging children's intake of sugar sweetened beverages	N	
Traditional foods and local food production		
Seek support for more bush trip on to country and involve youth on these trips	Y	A
Recommend to community leaders that royalty and/or store funding be used to purchase a community vehicle for hunting	Y	B
Request that the shire service through the CDEP program provide crowbars for women to use for hunting	N	
Re-introduce cultural week and promote traditional food during community festivals/ open days	Y (community B promoted traditional food during community festivals)	B
Recommend that knowledge on "caring for country" be documented	N	
Propagate/cultivate Indigenous plant foods for residents to plant in their home gardens	N	
Investigate infrastructure changes, such as fencing of billabong, that have impacted on residents'access to traditional food	N	
Initiate consultation with community on ideas to increase local food production; Recommend that CDEP consult with school about establishing a school garden	N	
Recommend that school and community garden work together	Y	B
Recommend that garden produce be distributed to families most in need	N	
Food Businesses		
Store board representatives request store manager to move sugar sweetened beverages to the refrigerator at the back of the store	Y	A
Store board representatives to consider more healthy food promotion in-store such as i) display poster of local football star with healthy food to encourage younger people to buy these foods; ii) In-store taste testing of fruit and vegetables including cut-up fruit at counter for the children to taste; iii) use of posters, ceiling banners, floor stickers to indicate healthier foods [B, C]]; iv) DVD showing cooking; v) posters linking food and health; vi) use of cartoons/animations to promote healthier food	Y	B, C
Store board representatives to advise on type of take-away food to be offered for sale through the store; community survey to find out people's take-away food preferences	N	
Store board consider that healthier food be made cheaper and this be promoted; fruit pieces be available at the counter at a reduced price; continue reductions on fruit and vegetables. (Store reduced the price of bottled water and prime meat cuts made cheaper)	Y	A
Store board to maintain good communication between store and community [B]; Store manager listens to the community	Y	B
Recommend to store board that there be a larger price differential between artificially sweetened soft drinks and sugar sweetened soft drink	Y	C
Recommendation to store board to introduce incentives to encourage healthier food purchasing, such as ii) for every child's purchase of a sandwich, get a free boiled egg; ii) a reward point system be built in to the store point of sale scanning system	N	
Store board representatives to encourage local people to work in store; invest in retail training for staff; store staff training on hygiene and food safety	Y	C
Recommend to store management to use food labels in take-away food outlet to provide information to consumers on healthiness of food product	N	
Store manager increase the variety/range of artificially sweetened drinks available for sale	Y	A, B, C
Store managers in both community stores remove the 1.25 L Coca-Cola	N	
Healthy food labelling: fruit, vegetables and water promoted in-store via the Jimmy Little campaign	Y	A
Store manager to prominently display healthier food. Confectionery was moved from the front counter and placed up higher on the shelves and the range was reduced	Y	B
Store manager to increase availability of fruit and vegetables in-store [B] and maintain a good range of healthier food	N	
Store manager to make more ready-made salads and salad sandwiches available for sale [A], family size meal packs and fresh meat and vegetable packs [B]	Y	A, B
Store manager to consider making food suitable for infants and toddlers available through the take-away outlet	N	
Store manager to use posters to inform customers of price difference between healthier generic brand products and other product brands	N	
Store manager to use shelf talker to provide instructions to consumers on household use of concentrated laundry detergent	Y	B
Take-away section be used to sell healthy food such as fruit when store is not open for business; extend take-away opening hours on a Friday evening	N	
Advocate to traditional land owners about concerns about the unhealthy food being made available through take-away outlets on traditional land	N	

Table 1 *(continued)*

Leadership and Partnerships	Implemented (Yes/No)	Community
Encourage other local agencies to buy produce from the store	N	
GFG representative to raise with local meat works that meat is tough	Y	B
Improved access to store food for people residing on homelands	N	
Community and Services		
GFG encourage all sectors of the community to consider how they can promote healthy food i) organise more bush trips [A] ii) promoting healthy food at community movie nights or community festivals [B, C] iii) promotion of healthy food in residential areas of the community (using already available materials i.e., videos and songs iv) GFG organise a healthy food event v) include salad and vegetables in food provided at different community events/programs vi) public health nutritionist (PHN) be involved in planning for more healthy food at public events and meetings in the community; PHN to ensure consistency of nutrition messages across sectors; PHN develop a visual healthy food guide; develop a recipe book (include low budget recipe ideas); GFG members present and share the nutrition education resources they use; encourage consideration of food purchasing behaviours in nutrition education	Y	A, B, C
GFG to encourage all food service providers to improve healthiness of the foods provided (e.g., through youth programs, crèche etc); provide more substantial meals through the school nutrition program; Aged-care meals accommodate clients preferences (such as meat and vegetables served separately)	N	
Clinic and store to implement "Healthy Food Fridays' where only healthy foods are available on Fridays	Y	B
GFG request that public health nutritionist conduct ongoing in-store cooking demonstrations and other healthy food promotion activities on an ongoing basis (rather than one-off); GFG consider supporting a community "Master Chef" where have a cooking demonstration competition; invite chef from take-away to do cooking demonstrations with families	N	
GFG recommend to community board that there be a session or meeting with young parents to discourage consumption of sugar sweetened beverages	Y	C
GFG consult more widely about possibility of a weight loss program	N	
Buildings, public places and transport		
Improvements in delivery of food to community through: i) Store board request weekly fruit and vegetable delivery rather than fortnightly [A]; ii) recommend to store management that time between food arriving at barge and delivery to store be minimised; iii) advocacy to government for improved road infrastructure to reduce road closure during wet season and resulting high cost of food	Y	A
GFG representative meet with housing reference group on housing issues that affect nutrition (such as inadequate food preparation and storage facilities and refrigerators)	N	
Consider how can improve household access to white goods e.g., recommend to Centrelink to promote to clients schemes available to support provision of whitegoods	N	
Recommendation for improved outdoors/ open air training facilities; a good food centre with a healthy shop that delivers customer education	N	
Raise with shire services need for improved public toilets; lobby government for a new rubbish bin (fastened and dog proof) and collection system and advocate to shire services to promote residents to pick up rubbish	N	
GFG advocate for more water bubblers throughout the community	N	

The community where there was evidence of action implementation is shown by the community identifier (A, B, C) in square parentheses

[a] Community D has been omitted as no follow-up meetings to the first annual planning meeting occurred.

of wet season food subsidies or improved road infrastructure to minimise road closure); and/ or (iii) were not feasible with the resources immediately available (such as a weekly rather than fortnightly fruit and vegetable delivery). As the GFS approach was evolving during the study period and GFS tools and processes were only finalised at the end of the project, operational procedures remained underdeveloped during the establishment of the GFS approach. As a result of this, it was not always entirely clear to community leaders and other stakeholders on the Group's purpose and role in community advocacy, nor what to expect and what their involvement would entail. Another factor that hindered implementation as previously reported, was that the process for communicating actions identified from the Good Food Group to the relevant agencies and community authorities was not clearly defined (Rogers et al., 2016). Further, a systematic procedure for prioritising, which in most cases was a long list of actions, was not clearly established, and was further limited by the time allocated for annual planning.

The time taken between an action being identified and implemented varied depending on the nature of the action. There was evidence of many of the actions being discussed over multiple review meetings prior to implementation, thereby highlighting the Good Food Group's

role in providing a forum for dialogue between stakeholders and the commitment demonstrated to achieving important outcomes despite the challenges.

Impact on community diet

There was a marked downward trend observed for month-to-month confectionery sales and a slight upward trend for water sales in all communities (Fig. 2). There was no clear evidence of an overall month-to-month increase in fruit and vegetable sales during the GFS period (Fig. 2) nor an overall month to month reduction in relative sales of regular soft drinks (Fig. 2). Community C showed improvements in all food and drink indicators except for relative vegetable sales.

There was keen interest shown by stakeholders in disclosure of the store sales reports in all four communities. Viewing a report with a few key messages and clear graphs was preferred. As stated by one Good Food Group attendee, it gave useful insights into what was being purchased and where to focus attention. All communities requested that the reports be publicly displayed and the information be made available to the wider community. Some stakeholders chose not to participate in meetings but were interested in receiving updates on the store sales
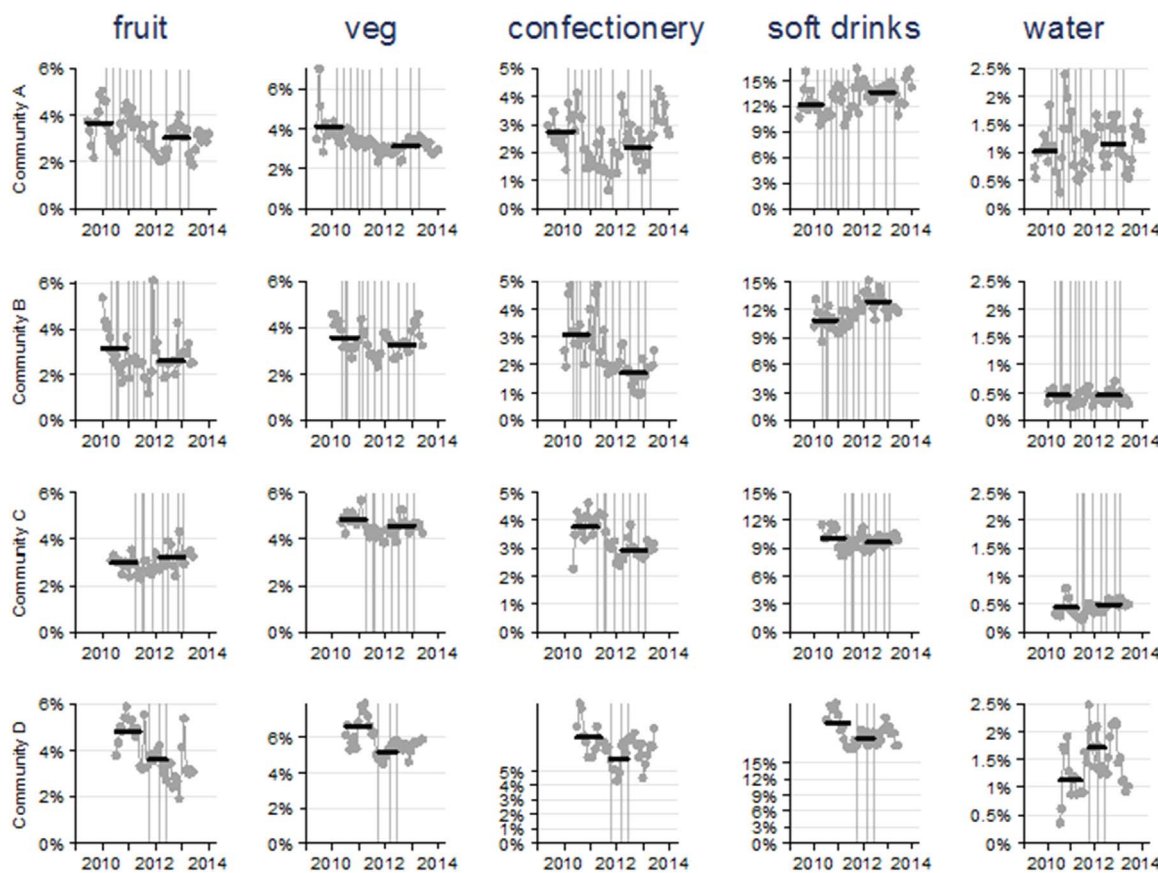
Fig. 2. Monthly sales of key food items in four communities (A to D) over time. The data for each food item is expressed as a percentage of total food and drink store sales ($). Local community GFS project meetings are shown by vertical lines. Lines of best fit show data 6 months before the project and in the last six months of the project.

data to share in their respective work places. The school principal in one community requested that the reports be made available to students and teachers for educational purposes. Another community made use of the community radio to disseminate information from the reports. All communities were interested in how they compared with other communities although we were not able to provide this information. The feedback received through participating in a Good Food Group, including store sales, was commented on by the shire service manager in one community (two years after project start-up) as important and novel as in her view it was the only meeting at the time where feedback was received. She stated that she passed on important information from the meetings to her staff. Similarly, after the Project had ceased in community C, a key stakeholder commented that he was missing the regular meetings as he found they provided useful information and feedback.

Discussion

These findings indicate that a multi-sector participatory approach through a continuous improvement mechanism can engage and support the commitment of both Aboriginal and non-Aboriginal stakeholders to achieve better food security in remote Indigenous communities, and that positive shift in community diet may occur in key areas where actions are implemented.

As we make clear throughout our results, the GFS multi-sector participatory continuous improvement approach was not without challenges. All four communities in this study were different and dynamic, emphasising the need for substantial project resilience and flexibility. It is through these challenges however that we believe we have been able to offer insights that will be useful for practitioners considering such multi-sector approaches to system change in remote Indigenous communities.

We anticipated that time investment would be required in setting up such a multi-sector approach to adequately understand the ways of the community, the structures of authority, and to agree on procedures for reporting and feedback and on the roles and responsibilities across all the sectors involved (Rogers et al., 2016). This project start-up phase is critical in putting in place the understanding and mechanisms needed to support the different agencies in the community to effectively participate in strengthening the food system. Time investment needs to be balanced though with building the trust of stakeholders and demonstrating the potential benefits of participation and commitment to the approach early in the project start-up phase. Future uptake of the GFS approach, by local residents or practitioners already servicing communities who have existing established relationships, would lessen the challenges we experienced in project start-up, and likely result in achieving effective engagement over a much shorter time period.

Once the process was understood, the findings demonstrate that the GFS approach enabled stakeholders to collectively identify and monitor the implementation of actions important to food security. This is important as most health promoting strategies occurring in remote Indigenous communities are primarily planned and implemented by a single organisation (Cargo et al., 2011). Instead, nutrition related initiatives could be integrated into the everyday practices and policies of services in communities. Evidence suggests that the "collaborative advantage" (Lasker, Weiss & Miller, 2001; Lasker & Weiss, 2003) that accrues from the exchange of knowledge and resources between stakeholders should result in programs that reach participants in a variety of settings and employ a range of strategies that aim to modify both the environment and the individual (Cargo et al., 2011). Implementation of actions, however, occurred in mostly one to three domains of the food system. It is likely that a greater emphasis at project start-up on establishing the operational procedures of the Good Food Group including clearly defined roles and responsibilities, prioritisation of a set

of actions, and engagement of higher level decision making authorities could have supported more successful implementation of actions across all the five domains.

A continuous improvement approach requires a structure of regular and collective prioritizing of evidence and expert informed actions and assessment of progress (Bailie et al., 2013). We found that four meetings per year was a large commitment of people's time, yet fewer meetings may have risked losing momentum and the ability of the group to achieve results. In communities where an inter-agency structure already exists with Indigenous representation, such as in Community D, and in communities where the different sectors involved are committed to progressing actions to address food security, one annual appraisal and planning meeting may suffice.

The ongoing commitment of the community coordinators, as we have reported elsewhere, was central to enabling project start-up and long-term engagement of the project with the communities and to the sustained participation of stakeholders (Rogers et al., 2016), particularly the Indigenous community residents. This finding is of significance since, as far as we are aware, no resources have been recently invested to build a local community-based workforce dedicated to nutrition and food security in remote Indigenous Australia. This is despite the burden of nutrition-related disease and the high prevalence of food insecurity reported, and despite only local people being privy to the many community nuances in beliefs and practices that can ultimately determine project success or failure.

Another challenge was fulfilling the key aim of enabling community members to have say in the development of their food system. The GFS approach provided a local decision-making platform for food system improvement. However, as many of the sectors relevant to the food system in three of the remote Indigenous communities were managed by non-Indigenous people, we found that this tended to skew the balance of Indigenous and non-Indigenous attendees. Ongoing communication with Indigenous leaders in the community, including those participating in the Good Food Group, should help ensure that the GFS approach continues to meet the expectations of the community in a culturally appropriate way and most importantly enable the concerns and ideas of community residents to be heard.

A challenge in each community was the need for resources to be made available across sectors rather than being restricted to a narrow food-related body. This is not unusual as partnerships between stakeholders take time to form. Indeed few community-based initiatives across Australia to improve diet and physical activity have adopted multi-strategy approaches (Whelan et al., 2015; Nichols et al., 2013). As Cargo et al. have commented, such collaborative approaches are unlikely to occur without a central organising body (Cargo et al., 2011). The GFS approach offers a promising structure to achieve this, however in a resource poor setting that requires a large investment in capacity building, additional resources will be needed to facilitate such a collaborative effort.

We found that it was possible to collect and report on store sales data in a timely and standardised way and that these reports were an important tool to facilitate dialogue on the performance of the food system. In community D, since Indigenous people already managed many of the services in this community and were therefore strongly represented in inter-agency meetings, integrating the feed-back of store sales reports at the community's interagency meetings may have been a more acceptable and feasible approach than endeavouring to establish another multi-sector group.

A limitation of the GFS approach on basing one outcome measure on store sales data is that if the focus of the Good Food Group is on other aspects of the food system such as quality of meals served to the elderly or on the school canteen, or on improved access to traditional food, then measures other than stores sales data will be needed. The community store however was a major food source within our project communities and store sales data provided an efficient, objective, cost-effective and powerful proxy of dietary quality at the community level

(Brimblecombe et al., 2012; Wycherley et al., 2016).

The capacity of the Good Food Group to influence the food system across all five domains is likely to be reflected in the trends observed in food spending. The overall trends for confectionery and water were encouraging but those for fruit, vegetables and regular soft drink were less clear. Placing the confectionery out of reach and sight of children, and reducing the number of confectionery product lines were actions relatively easily implemented and sustained within the available resources and the commitment of storeowners, management and staff. Improvements in fruit and vegetable sales were more challenging as they required action in all food system domains and lobbying for political and structural change (for example improved delivery systems, infrastructure and pricing). It must be noted that it can take many years for a community to build sufficient capacity to use their collective power to lobby for political and structural change (Cargo et al., 2011) and that therefore it is important to not have unrealistic expectations on what a Good Food Group can achieve in the early years of establishment. Our findings suggest however that in association with the GFS project positive shifts in sales occurred in some key areas where actions were implemented. Without a control group however, we cannot know if these occurred as a result of the GFS project.

We hope that reporting on this study can lead to up-scaling this approach across other remote communities. The opportunity to undertake a comparative multi-site case study in four communities that met the selection criteria allowed feasibility to be assessed across remote Aboriginal communities with a degree of diversity. Stakeholders found the GFS useful and of benefit to their community (Rogers et al., 2016), however, no community or agency was in a position to dedicate the resources to continue the process. Since designing our assessment of feasibility, Bowen et al. (2009) proposed a set of eight areas of focus to guide the design and evaluation of feasibility studies. Our assessment of feasibility, including the assessment of acceptability, usefulness and benefits from the perspective of stakeholders from our previous work (Rogers et al., 2016), considers to some extent all eight areas of focus, except for 'integration'. Further research is required to investigate where the opportunities exist to embed the GFS approach in the existing governance structures and services. Since we were unable to assess change with time in the performance of the food system as the tool to do this was not fully developed until near the end of the project, further research is also needed to demonstrate the degree of project impact over time.

The potential feasibility of such a continuous improvement approach has implications for policy makers and health practitioners. Sustained and positive dietary change in this context has been shown repeatedly to be difficult to achieve (Lee et al., 2016). Evidence is emerging that this facilitated dialogue among stakeholders can be a catalyst to shifting attitudes and practice that can then lead to important system change (Swinburn et al., 2005; Bushe & Marshak, 2009; Edvardsson et al., 2012; Edvardsson et al., 2011). This approach however needs buy-in from all relevant sectors and investment in a facilitator whose role is to drive the process together with an employed local community person. The GFS approach ensured that the issue of food security was high on the agenda and part of the dialogue of community leaders and service providers. A performance audit of the Australian Government's food security initiative for remote Indigenous communities reported that "against expectations, the Strategy did not establish a framework to coordinate food security initiatives, and as a consequence, the Australian Government's food security initiatives have operated in isolation from each other and are mostly focused in the Northern Territory. As such, the Strategy's contribution to food security is limited. The current activities are predominantly focused on the supply of affordable and healthy food to remote communities through community stores" (Australian National Audit Office, 2014). The GFS approach offers a way forward to adopt a more systems and integrated approach to food security that has local leaders at the heart of decision-making. The emerging literature on collective impact (Kania & Kramer,

2011) and group model building (Hovmand, 2014) can also guide further work in the area of multi-sectoral approaches to improving food security.

The GFS approach also has relevance for policy-makers and practitioners responsible for shaping community-based initiatives to prevent obesity and non-communicable disease beyond remote Indigenous Australia. We are aware of no other initiatives that have taken a long-term whole of system community-level approach to improving the food environment and food security. The GFS approach builds on frameworks already available for priority setting of actions for obesity prevention and/or food security in communities such as the Analysis Grid for Environments Linked to Obesity (ANGELO framework) (Swinburn et al., 2005; Simmons et al., 2009; Wood, Budge & Ray, 2010) and offers a structured process that potentially could be modified to support organisations in any context to adopt upstream, evidence-informed strategies; and to facilitate nutrition integration into everyday practices, policies and environments; a process that has been shown to be lacking at least in Australia but critical for prevention of obesity and non-communicable disease (Pettman et al., 2015; Nichols et al., 2013). Uptake of a multi-sector participatory continuous improvement approach with communities in remote Australia may help to achieve an integrated approach to food security to effect positive change and lead to sustained improvement in health.

Author contributions

Sources of support

Ethics

Ethics approval for all aspects of the Project was attained from the Human Research Ethics Committee (HREC) of the Northern Territory Department of Health and Menzies School of Health Research (ref. HREC 09/07), Cairns and Hinterland Health Service District Ethics Committee (ref. HREC/10/QCH/71-678) and the Central Australian HREC (ref 20090202). Signed partnership agreements were negotiated with participating organisations and communities.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.ssmph.2017.06.002.

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