Abstract

Objective: Chronic diet related diseases impact on Aboriginal people much earlier in their lives than the rest of the Australian population. The aim of this study was to examine the influence that community stores have on the health of Aboriginal people within the Fitzroy Valley region of the Kimberley.

Methods: Community based data were provided by a cohort of 401 male and female participants aged 18-76 years old. All 401 participants responded to a survey of questions relating to social, economical and environmental influences affecting their acquisition, acceptance and consumption of food. Participants also took part in a modified health check.

Results: A number of correlations were found to be significant when descriptive and inferential statistics were applied to the data collected. Inferential statistics using Spearman’s correlations (store/score correlations) revealed that stores ranking higher in quality correlated positively with self assessed health status as well as individual triglyceride levels. Participants who purchased foods from stores with higher scores felt they had enough money to purchase healthy food and they purchased significantly more vegetables. The cost of fruit and vegetables was significantly lower in stores with higher scores; however the overall cost of foods was significantly higher in these stores.

Conclusions: Community stores within this study had a significant influence on participants self assessed health status and individual triglyceride levels. More vegetables were purchased in stores with higher scores and participants felt they had enough money to purchase health food from these stores, even though stores with higher scores were more expensive overall.

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Introduction

Reliable, community based information, describing the impact that community stores have on the health and wellbeing of Aboriginal people in the Central Kimberley is limited. In contrast, a number of reports over the last twenty-five years have documented high prevalence rates of nutrition related chronic disease in Aboriginal communities, both in remote and town based regions of the Kimberley (1-5). Diet related diseases, particularly obesity and type 2 diabetes are widespread in Aboriginal communities throughout Australia (6). Efforts to address the problem of poor dietary intakes and associated chronic disease in Aboriginal communities are failing dramatically in the fight against poor health outcomes that begin in-utero and progress throughout an individual’s lifetime. Aboriginal people within the Kimberley are burdened by the fourth highest prevalence rates of type 2 diabetes in the world (7). Although less likely to be classified as overweight, Aboriginal people are twice as likely to be obese than non Aboriginal people in Australia (8). Many of the chronic and often debilitating diseases present themselves at a much younger age in Aboriginal people in comparison to non Aboriginal Australians. Nutrition related diseases, including type 2 diabetes and certain cancers such as prostate, breast and colorectal cancers are likely to be increasing in Aboriginal communities (9, 10). Adequate nutrition is essential throughout all life stages and an important means in the prevention against the aforementioned nutritional related diseases.

The importance of community stores within remote Aboriginal communities is demonstrated by the fact that as much as 95% of all the food that is eaten within community is purchased from the community store (11-13). In communities where unemployment is exceedingly high and education and training opportunities are at best limited, community stores often remain the only stronghold; where employment and training opportunities are a constant. Many of these associated benefits from the community store can be transferred to the wider community. Community stores are not only the main socioeconomic enterprise in the community, but should also be regarded as having an essential role in long term employment, education and training and provide a priority setting for achieving goals in educating about food, nutrition issues; particularly food security and promoting general and physical wellbeing (13).

The House of Representatives Standing Committee on Aboriginal and Torres Strait Islander Affairs has initiated an inquiry into remote Aboriginal and Torres Strait Islander stores, beginning in early 2009. To date there has been a focus on six key areas that include; food security, supply, quality, cost, transport and competition issues.

Setting

The Fitzroy Valley is home to approximately 3500 Aboriginal people. In the most remote communities, populations within these communities are often entirely Aboriginal. Six distinct languages

![Figure 1  Map of Fitzroy Valley Communities](image)
exist within the Fitzroy Valley including the local Fitzroy Crossing Kriol. Walmajarri and Bunuba are the most widespread of the native languages and the most frequently used. English may be the second or third language spoken, particularly by the elderly.

Although there are forty communities within the Fitzroy Valley, seven of these communities were either unoccupied or inaccessible during the period of the study and could not be included in the research. The only sealed road in the Fitzroy Valley, the Great Northern Highway extends from Fitzroy Crossing to the west towards the closest regional town of Derby (260km), while the same road extends east towards the closest regional town of Halls Creek (290km). When the wet season arrives, road closures and disruptions to local airstrips can isolate communities for up to three months. This validates and indeed clearly illustrates the vastness of the region.

Thirty-three remote Fitzroy Valley communities participated in a voluntary community based study, which formed the basis of an ongoing quality improvement process on behalf of the solitary community owned, controlled and operated health service within this vast region of the Kimberley. As the primary researcher routinely works alongside members of the Fitzroy Valley community, the purpose of this study was also to produce a position paper illustrating the influence that community stores have on the health of Aboriginal people within the region.

Participants

All Aboriginal community members within the Fitzroy Valley, eighteen years and older were invited to participate verbally within community focus groups. Focus groups were conducted with the permission and support of community chair people. Aboriginal colleagues were present throughout each session and process within this study. At times, focus group sessions had to be extended to 2-3 sessions to cater for community demand. All participants were able to communicate in English, however further explanation and revisions of questionnaires were occasionally needed and Aboriginal Health workers were always available to assist. Data were collected and documented by the primary researcher between 12th April 2009 and 10th September 2009. Data were taken across thirty-three communities within the Fitzroy Valley Region of the Kimberley. There were 401 participants recruited (n=401). Participants were asked to clearly define their primary place of residence. Participants, who identified their primary place of residence, were required to have lived within their community for at least five consecutive years.

Ethics Approval

The project was overseen by the CEO of the Nindilingarri Cultural Health Services (NCHS), who sits on the subcommittee of the Kimberley Regional Planning Health Forum that oversees all research projects conducted in the Kimberley. All forms of community consultation and data collection were done under the auspices of the CEO. Formal research ethics approval was not sought, as the project and research conducted are everyday components of both service delivery and data collection required for the NCHS nutrition program.

Methods

Store based data collection

I)

Seven community stores were consulted within the study period. Store managers and employees were questioned after permission was granted by community chair people and the corresponding community board. One community store, Ngalapita was excluded as the store had ceased trading due to financial and management difficulties. The remaining six community stores were consulted and awarded a store ranking. Forty criteria were used to rate the quality of each store using the Remote Indigenous Stores and Takeaways (RIST), ‘How healthy is your Store?’ checklist. This checklist is a significant element of the 2005 project funded by several State and Territory governments to formulate approaches of improving access to a healthy food supply for Aboriginal and Torres Strait Islander people in remote communities. Although the RIST stores checklist was not designed to rank the quality of remote community stores, it was utilised and adopted within this study as the criteria or checklist contained within it was determined suitable to differentiate very poor quality stores from very good quality stores. Stores were graded on a scale of one to five:

<table>
<thead>
<tr>
<th>Store Score</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Poor</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
</tr>
<tr>
<td>3</td>
<td>Average</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>5</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

The forty criteria within the RIST store checklist include; twenty-nine criteria with a primary focus on nutrition, six on store management, while the remaining five criteria focus on the promotion and marketing of healthy foods. One point was allocated for each of the criteria that were validated by the primary researcher. Cost and value of foods were not considered at the time of data collection.

II)

An adapted version of the NT Nutritionists Market Basket survey was utilised as an instrument, on the basis that foods within this survey were more often available within the community stores. The
NT market basket is alleged to provide 95% energy requirements and 100% or more of selected micronutrients for a family of six for a two week period (14, 15). The most recent market basket survey, prior to this study was completed in 1998; however this survey did not take into account all of the existing Fitzroy Valley community stores. Within the NT market basket, cost of foods were analysed using thirty food items, selected from six categories. The categories were Breads and Cereals, Fruit, Vegetables, Meats & Alternatives, Dairy and other Foods. All foods had to be available to community members throughout the year. The cheapest items were included in the survey. Generic brands were avoided where possible to remain impartial, as only one store stocked generic brands. Comparable items were selected and analysed within each of the stores. Many of the items selected for pricing within the survey were present across all of the stores and this also reduced any associated bias.

Data from regional stores, including Broome, Derby and Halls Creek was collected to provide comparisons. Stores in major capital cities were also included and comparisons were drawn alongside these stores together with the community stores described within this study.

Community based data collection

I) Participants of the study were contacted in their own community. Data were collected in a range of community settings, including community clinics, community stores, men's sheds, homes, parks and recreational areas. In the course of providing conventional nutritional services through Nindilingarri Cultural Health Services, the research project was described to all potential participants. All participants were invited to take part in a modified health check, which consisted of the measurements described below. Although, there are limitations in relying on these measurements in isolation, the measurements were selected as justifiable indicators particularly significant to diet, nutrition and lifestyle behaviours.

• Blood Pressure (BP)
• Waist circumference (WC)
• Body Mass Index (BMI)
• Random Blood glucose level (BGL random)
• Non-fasting Total Cholesterol level
• Non-fasting Triglyceride level (TG)

II) A multiple choice questionnaire was attached to the modified health check and participants were guided through the questionnaire and instructed to fill in their responses. A one to five scale was used. The questionnaire consisted of ten multiple-choice questions with a focus on food access, food affordability, food acceptability and income. Assistance was available from the primary researcher and Aboriginal Health workers present.

Assistance was given to participants to clarify terms used such as food access and differentiating types of income. Responses were checked when individual health checks were in progress. This gave participants time to discuss the questionnaire face to face and fill out their responses with the aid of the primary researcher. As a leading question, participants were asked which community store they purchased their food from and this was documented alongside the health check. Each individual modified health assessment took between 5-10 minutes to complete. All data from the questionnaire and the corresponding modified health check were then entered into a Microsoft Office Excel™ spread sheet.

Data were examined and discussed using means testing and descriptive graphing.

Statistical analysis

Descriptive and inferential statistics were applied to the data. Due to the nature of the data, distributions and the number of ‘outliers’, non-parametric analyses were performed. Inferential analysis was conducted using Spearman's correlations between all continuous variables (all components of the modified health check), as well as the store score and each of the ten questions within the questionnaire.

Mann Whitney U tests were conducted comparing all health indicators and all ten questions across the following:

- Store score groups where median used to split group (1-3 = low group, 4-5 = high group)

Significance level was set conservatively at 0.01 because of multiple comparisons being made. Only those findings that are significant at 0.01 or below are reported.

The statistical analysis was performed using SPSS for Windows version 12.0™.

Results

A number of correlations between study variables were found to be significant. Key findings are reported below.

Inferential statistics conducted using Spearman's correlations revealed the following correlations:

<table>
<thead>
<tr>
<th>Store Score Correlations with</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>0.135</td>
<td>0.007***</td>
</tr>
<tr>
<td>Self assessed health</td>
<td>0.416</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Access Safe &amp; reliable transport</td>
<td>0.473</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Enough money to buy healthy food</td>
<td>0.454</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Amount of vegetables purchased</td>
<td>0.449</td>
<td>&lt;.001***</td>
</tr>
</tbody>
</table>

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As noted in Table 2, ‘Store Score’ correlated negatively with triglyceride levels. That is where the stores were rated as very poor, participants showed elevated triglyceride levels, in contrast, participants who purchased foods from stores that were rated very good had triglyceride levels that were significantly lower.

Also, as reflected in Table 2, ‘Store Score’ correlated positively with:

- **Self assessed health status**
  Participants with higher store scores rate their overall health as being good to excellent, significantly higher than those with lower store scores.

- **Access to safe and reliable transport**
  Participants with higher store scores were significantly more likely to have access to safe and reliable transport and were in many cases able to travel longer distances to stores with higher scores, which were often some distance from their own community store.

- **Having enough money to buy healthy food**
  Participants who accessed stores with high scores were significantly more likely to feel that they had enough money to buy enough healthy food than participants that purchased their foods from stores with lower scores.

- **Amount of vegetables purchased**
  Participants purchased significantly more vegetables if their community store had a high score compared to participants that purchased vegetables from stores with lower scores.

As noted in Table 2.1, store score groups where the median used to split group (1-3 was a low group and 4-5 was a high group).

- **Triglyceride levels** were significantly higher in store scores that were grouped very poor to average (1-3), than those stores that were ranked good to very good (4-5).
- **Self assessed health status** were significantly higher in participants with higher store scores.
- **Participants** were significantly more likely to feel that they had enough money to buy healthy food if they purchased their foods from stores with higher store scores, compared to lower store scores.

It is widely accepted that food costs in remote aboriginal communities are excessive. In the Fitzroy Valley, a market basket analysis was conducted to illustrate the reality of how excessive foods cost can be for Aboriginal people, particularly when purchasing fruits and vegetables.

### Table 2.1 Significant Mann Whitney Comparisons (Grouped Store Score Comparisons)

<table>
<thead>
<tr>
<th>Store Score</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>Low Store Scores</td>
<td>-3.667</td>
</tr>
<tr>
<td>Self assessed health</td>
<td>High Store Scores</td>
<td>-9.441</td>
</tr>
<tr>
<td>Enough money to buy healthy food</td>
<td>High Store Scores</td>
<td>-8.873</td>
</tr>
<tr>
<td>Amount of vegetables purchased</td>
<td>High Store Scores</td>
<td>-7.941</td>
</tr>
</tbody>
</table>

As noted in Table 2.1, store score groups where the median used to split group (1-3 was a low group and 4-5 was a high group).

- **Triglyceride levels** were significantly higher in store scores that were grouped very poor to average (1-3), than those stores that were ranked good to very good (4-5).
- **Self assessed health status** were significantly higher in participants with higher store scores.
- **Participants** were significantly more likely to feel that they had enough money to buy healthy food if they purchased their foods from stores with higher store scores, compared to lower store scores.

### Table 3 Market Basket Comparative Costs

<table>
<thead>
<tr>
<th>Area</th>
<th>% Market Basket</th>
<th>% Fruit</th>
<th>% Vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perth</td>
<td>100</td>
<td>$437.74</td>
<td>100</td>
</tr>
<tr>
<td>Regional (Derby)</td>
<td>155</td>
<td>$492.17</td>
<td>112</td>
</tr>
<tr>
<td>Store (highest cost)</td>
<td>253</td>
<td>$941.28</td>
<td>192</td>
</tr>
<tr>
<td>Store (lowest cost)</td>
<td>178</td>
<td>$671.44</td>
<td>153</td>
</tr>
</tbody>
</table>

As noted in Table 3, the market survey illustrates the widespread discrepancies in the cost of food items. Using Perth as a baseline (index = 100) and the regional town of Derby as a comparison, as it is the closest regional town.

A breakdown of the market basket survey (Figure 2) clearly illustrates the widespread discrepancies in the cost of food items.

Cost comparisons of fresh fruit (Figure 2.1) and vegetables (Figure 2.2) illustrate even greater discrepancies in the cost of fruit and vegetables.
2009 Kimberley Market Basket Survey: Kimberley Stores & States/National Outlets

Figure 2 Market Basket Cost Comparison between Capital Cities, Kimberley regional towns and Fitzroy Valley Community Store

2009 Kimberley Market Basket: Cost Comparison (Fresh Fruit)

Figure 2.1 Cost comparison of Fruit for a hypothetical family of six in 2009.
Community stores influence the health of Aboriginal people living in the Fitzroy Valley region of the Kimberley

Discussion

Significant observations in this study have been observed between community store quality as assessed by store score and the health of participants as demonstrated by self assessed health status and individual triglyceride levels. Community stores influence both self assessed health status and individual triglyceride levels.

Store scores correlated positively with self assessed health status. The use of self assessed health status (SAHS) is a performance measure and it is widely accepted that the way a person views his health is importantly related to subsequent health outcomes (16). Participants who purchased foods from stores with higher store scores identified their health as good to excellent, significantly higher than those who purchased foods from stores with lower scores.

Participants who purchased their food from stores with high scores had significantly lower triglyceride levels. Consequently, participants who purchased foods from stores rated poorly showed they had raised triglyceride levels. The influence community stores have on individual triglyceride levels is significant as there is a strong association between elevated triglycerides, poor diet and a number of diseases, including type 2 diabetes (17).

Significant correlations in this study have also been observed between store quality and participants having enough money to buy food as well as the amount of vegetables participants purchased. Participants also felt they had enough money to buy food from stores with higher store scores and participants purchased significantly more vegetables from stores with higher scores.

The cost of fruit and vegetables was significantly lower in community stores with higher scores; however the overall cost of the food basket was significantly higher. An increase in the purchasing of vegetables in particular was positively associated with stores with higher scores. This illustrates that participants shopping in stores with high scores were spending significantly less money on fruit and vegetables, but significantly more on their grocery bill overall. As discussed earlier, participants shopping at stores with higher scores felt they did have enough money to purchase food, and therefore could afford to shop at these stores.

Not all participants felt they had enough money to buy healthy food, especially those that purchased foods from stores with lower scores. Current evidence suggests that the quality of food purchased in Aboriginal communities is determined significantly by cost (18). Aboriginal people in the Fitzroy Valley region of the Kimberley have the lowest individual and household incomes of any group of people in Australia (19). Unemployment rates can be as high as 90% in many communities. Economically marginalised groups have been shown to be motivated by getting the most out of every food dollar spent (20). Important findings within this study have supplemented current evidence that food choices in Aboriginal communities are consistent with the 'economics of food choice' theory; however other significant factors clearly play a role in food purchasing behaviours of Aboriginal people. Stores with the highest store scores had the lowest priced fruit and vegetables in the Fitzroy Valley, without being the cheaper stores in the market basket survey overall. Overall market basket cost did not correlate positively with community store score.

Low incomes combined with excessive food costs in the Fitzroy Valley result in individuals and families having to spend a large percentage of their income on food, just to meet basic requirements. This study revealed that more than 70% of the 401 participants...
(n=282) are unemployed. In addition to Centrelink and Community Development and Employment Projects (CDEP) payments, a remote area fortnightly allowance of $18.20 for individuals, $15.60 if partnered and $7.30 for each independent child has been devised to absorb some of the living expenses of living in remote areas. As illustrated this is insignificant in comparison to the excessive food costs seen in remote Aboriginal communities. Disparities in food prices in remote communities within this study have heighted dramatically from previous research studies of 40% in the late 1980s (21) and 60% in the late 1990s (22, 23).

The results of this study highlight the importance of having higher quality community stores in Aboriginal communities that contain nutritious and affordable foods, particularly fruits and vegetables. Store quality has been shown to influence the health of Aboriginal people. Cost of food remains a significant factor in determining an individual’s purchasing behaviour within Aboriginal communities. The quality of the community store is also a significant factor that influences an individual’s purchasing behaviour and consequently their nutritional health. Current initiatives that are subsidising fruit and vegetable prices are negatively affecting the price of other essential and nutritious food products including cereals, whole grains and low fat dairy.

Acknowledgements

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Competing interests

None identified.
Community stores influence the health of Aboriginal people living in the Fitzroy Valley region of the Kimberley

References


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