The role of energy cost in food choices for an Aboriginal population in northern Australia

Julie K Brimblecombe and Kerin O’Dea

ABSTRACT

Objective: To explore the relationship between dietary quality and energy density of foods (MJ/kg) and energy cost ($/MJ) for an Aboriginal population living in a remote region of northern Australia.

Design: For a 3-month period in 2005, we collected food and non-alcoholic beverage supply data from food outlets available to the study population. From these data, we compared the energy density of foods with their energy cost.

Main outcome measures: Energy density and energy cost of food purchases.

Results: The diet of the study population was high in refined carbohydrates and low in fresh fruit and vegetables. Foods with high energy density were associated with lower costs and contributed disproportionately to energy availability.

Conclusion: The energy–cost differential between energy-dense, nutrient-poor foods and energy-dilute, nutrient-rich foods influences the capacity of Australian Aboriginal people living in remote communities to attain a healthy diet. This is consistent with the "economics of food choice" theory, whereby people on low incomes maximise energy availability per dollar in their food purchasing patterns, and has particular relevance for developing nutrition policy and strategies in Aboriginal communities, where poor nutrition is a major determinant of preventable chronic disease.

MJA 2009; 190: 549–551

METHODS

Study population and food outlets

Our study was conducted in an island community (population, about 1700 people, of whom 93% are Indigenous) located 550 km from a major urban centre. At the time, community food outlets included a community store, two convenience shops (takeaway outlets), a school canteen and a government-sponsored, aged-care program providing weekly fresh food parcels to 16 community residents. Alcoholic beverages were prohibited. Foods acquired through subsistence procurement were not included in our analysis.

Data collection

Electronic food-transaction data were provided by the community store for a 3-month period in 2005. All food and beverage items with accompanying unique identifier, unit weight, quantity sold, and dollar value (retail price) were electronically extracted from store data and imported to a Microsoft Access database (Microsoft Office Access 2003, Microsoft Office Professional Edition, Microsoft Corporation, Redmond, Wash, USA).

Weekly food orders were collected for the same 3-month period for the other food outlets and services. These data were entered into Microsoft Excel 2003 (Microsoft Office Excel, Microsoft Corporation) in the field and imported into the database.

Data for all food outlets were combined (community food supply). Food and beverage weights were expressed per edible fraction and their energy and nutrient contents were obtained from the Australian Food and Nutrient Database (AUSNUT 1999). Volumes were converted to standard weight using the AUSNUT conversion factor. Food items were aggregated into major food groups and subgroups, as defined by the AUSNUT Food Grouping System. The percentage contribution of each major food group and subgroup to total energy available through the community food supply was determined.

Estimated energy requirement

An aggregated daily energy requirement for the study population was determined, based on age- and sex-distribution, anthropometric data and estimated physical activity level. The mean height and weight for adult age-groups between 19 and > 70 years (19–30; 31–50; 51–70; > 70 years) were determined from available anthropometric data. For those < 18 years in the population, the midpoint of the estimated energy requirement range for each of the categories of age and sex was used to determine an estimated energy requirement. For all age-groups, a physical activity level of 1.6 was applied.

Contribution of food groups to dietary energy and dietary cost

Energy density was defined as the amount of available energy per unit edible weight of food.
ables, meat and fruit, which provided (< 0.26 $/MJ), compared with fresh vegetables, providing dietary energy at minimal cost.

Box 2. Sugar, cooking oil, rice, margarine found in the community store are given in Energy costs (in $/MJ) of a range of foods contributed least energy relative to cost. In contrast, nutrient-dense foods such as meat, fruit and vegetables — provide more nutrients per dollar spent, there is good evidence that, with sustained budgetary constraints, quality is compromised before quantity, with consumers maximising calories for dollars spent.

The results of our study highlight the importance of modelling the food supply available to Indigenous people in remote areas to identify practical modifications that can be achieved at minimum cost. Achieving nutritional recommendations at minimum cost, however, is a challenge, as often taste and convenience are compromised, and the resulting diet is markedly changed from the typical diet, with much less fresh produce. On the basis of self-selected diets, it has been shown that, under normal circumstances, high-quality diets cost more.

A primary motive for our study was to better understand why the poor-quality dietary patterns of remote Indigenous communities have changed little over more than two decades. This dietary pattern has been attributed to conservative food preferences resulting from the historical government policy, from the time of early European settlement through to the early 1970s, of providing rations for Indigenous Australians. This pattern is reinforced by contemporary issues of limited availability of healthy food choices, high food costs and limited household-storage and food-preparation capacity.

Our study shows that low income is a powerful driver of food choice — a factor compounded in remote communities by high costs of perishable foods, such as meat, fruit and vegetables. Our study focuses on one large, remote community, but similar

| 1 Community food supply — percentage energy and cost contributions to total energy and total diet cost, and dietary energy cost, for each of the major food groups |
|---|---|---|
| Energy cost | % Cost | % Energy |
| Energy cost ($/MJ) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Percentage change in energy costs | 0% | 10% | 20% | 30% | 40% | 50% |

| 2 A range of community food items and their energy costs ($/MJ) |
|---|---|---|
| Meat, meat products, poultry, fish and egg |
| Prawns (7.64), canned oyster (5.52), drumstick (3.91), beef steak (3.77), chicken wing (3.21), lamb chop (3.15), kangaroo (2.92), canned tuna (2.81), minced meat (2.57), crumbed fish (2.47), bacon (2.32), canned comoned beef (2.06), chicken nugget (1.93), canned spam (1.56), fish fingers (1.44), fresh egg (1.01), sausage (0.62) |
| Fruit and vegetables |
| Asparagus (110.70), alfalfa (42.1), cucumber (21.16), strawberry (18.21), Chinese cabbage (14.97), lettuce (12.16), tomato (11.15), broccoli (9.79), celery (9.85), grapefruit (7.73), zucchini (7.03), rockmelon (6.93), orange (5.11), fruit pieces (4.17), mandarin (3.89), canned peaches (3.77), fresh corn (3.10), capsicum (2.99), grapes (2.49), pineapple (2.03), frozen corn (2.00), apple (1.97), canned mixed beans (1.84), canned kidney beans (1.79), sweet potato (1.58), canned pineapple (1.53), avocado (1.07), potato (0.64) |
| Milk and milk products |
| Ice cream bar (2.79), regular yoghurt (2.27), flavoured milk (1.30), reduced-fat milk (1.31), full-cream milk (0.92), cheddar cheese (0.91), milk powder (0.63) |
| Cereals and cereal products |
| Pie (1.67), sweet biscuit (0.75), bread (0.55), oats (0.54), rice (0.18), flour (0.19) |
| Fats and sugars |
| Chewing gum (2.89), chocolate (2.61), sweets (2.05), butter (0.26), margarine (0.25), white sugar (0.20), oil (0.15) |
| Beverages |
| Orange juice (2.8), fruit drink (2.32), cola (2.2), cordial (0.43) |

DISCUSSION
The most important finding in our study was the marked gradient in cost per MJ between low-quality foods, rich in refined carbohydrates and fats, and the high-quality, nutrient-dense foods recommended in the Australian guide to healthy eating, illustrating the inverse relationship between energy density and energy cost, consistent with published data.

The dietary pattern we found — low intake of fruit and vegetables and high intake of refined carbohydrates — is consistent with that reported for economically marginalised groups in Australia and other affluent Western societies. Although
socioeconomic conditions and disparities in food costs exist across all Indigenous communities in Australia.

This is the first demonstration of the relationship between energy density, energy cost and dietary patterns for an economically marginalised Indigenous population in Australia. By placing nutritional improvement in an economic, rather than an individual behavioural change framework, our study highlights the investment that improving nutrition for Indigenous people in remote communities will require.

AUTHOR DETAILS
Julie K Brimblecombe, PhD, MPH, GradDipNut&Diet, NHMRC Postdoctoral Research Fellow

Correspondence: julie.brimblecombe@menzies.edu.au

REFERENCES

(RECEIVED 11 Sep 2008, accepted 16 Feb 2009)