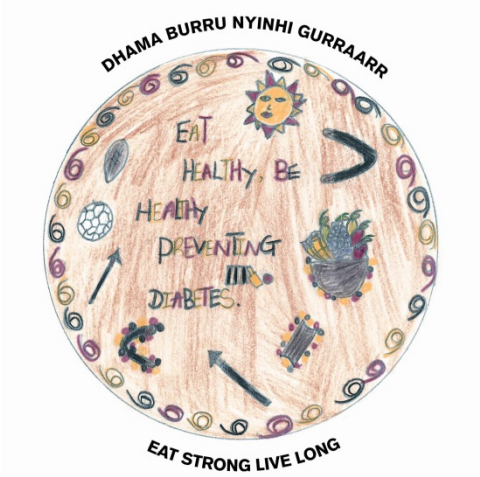
Many Rivers Diabetes Prevention Project

An Aboriginal community governed program of research and health promotion for children.

NSW Ministry of Health
SHORT REPORT
AUGUST 2014



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Our thanks to the families, and in particular the children, of the participating communities.

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BACKGROUND

The Many Rivers Diabetes Prevention Project (MRDPP) commenced in 2001 at the request of Mr Stephen Blunden then the CEO of Durri Aboriginal Corporation Medical Services (ACMS) in Kempsey, on the mid north coast of NSW. Mr Blunden called for a program "to prevent children from growing up to get diabetes", and requested that this program for Aboriginal children be inclusive of non-Indigenous children. The MRDPP consisted of three phases and this report describes the design, impact and outcomes of the third phase (MRDPP-3), a program of research and health promotion for Aboriginal and non-Indigenous rural children conducted between 2007 and 2012. The MRDPP-3: addressed the risk factors for type 2 diabetes of low physical activity participation, unhealthy food intake and overweight/obesity; was governed, delivered and supported by the participating Aboriginal communities in Taree and Kempsey in partnership with the University of Newcastle; and adopted a 'bottom-up,' primarily school-based approach for the delivery of health promotion to children in the participating regions in school years 5 to 8.

In 2011 both the participating areas were reported as having a higher than the national proportion of Aboriginal people (2.6%), with Kempsey at 11% and the Greater Taree area at 5.4% (1). Both areas are also classified by the Australian Bureau of Statistics (ABS) as areas of high relative socio-economic disadvantage with Kempsey possessing the lowest Socio Economic Indexes for Areas (SEIFA), having a decile of 1 (with decile of 10 being those areas with least relative disadvantage) and Taree a SEIFA decile of 2 (2).

The MRDPP laid the foundations for a series of related programs that are currently being conducted, including: Aboriginal children's exploration of barriers they perceive to participation in physical activity – the 'Photovoice' project; a systematic review of the literature on Aboriginal and Torres Strait Islander nutrition; and the implementation of the inclusive 'Go4Fun' programs aimed at Aboriginal children above the healthy weight range.

There is a lack of published evidence regarding the impact of programs to improve the health of Aboriginal and Torres Strait Islanders in Australia (3). Only three studies (4-6) have examined the impact of such strategies for Aboriginal children, two of which address nutrition. The MRDPP-3 is the first Australian study at population level that examines the impact of program to promote healthy food intake and physical activity participation by Aboriginal children and one of a few to do so for rural children in general.

AIMS of MRDPP-3

1. Maintain a research collaboration governed by an Aboriginal community.
2. Build the capacity of Aboriginal project officers, Aboriginal Medical Services and the community to deliver, engage in and govern research projects in their communities.
3. Describe the determinants of physical activity participation and healthy food intake for Aboriginal children.
4. Develop and deliver a school-based Aboriginal community governed health promotion program to Aboriginal and non-Indigenous children in school years 5 to 8 designed to improve: children's knowledge about diabetes; their healthy food intake; and physical activity participation.

5. Evaluate the impact of the health promotion program on children's: knowledge about diabetes; physical activity levels; fruit and vegetable intake; sugary drink intake; and body mass index.

MRDPP-3 OUTCOMES

AIM 1: Aboriginal Community Governance of the MRDPP-3.
The strong Aboriginal community governance structure of the MRDPP-3 was built on work previously undertaken by the MRDPP in Phases 1 and 2. Features of this structure include: Aboriginal community reference groups in each participating community that met at least quarterly to guide the research; a minimum of 80% Aboriginal membership of the Steering and Advisory committees; the development and use of data access agreements between the partners and experts who were invited to assist with data management; and the development of Memoranda of Understanding between the partners and local organisations, with the aim of ensuring the intent of the project was transparent.

This approach was based on Community Based Participatory Research models (7), maintained a strong capacity building focus, and was shortlisted as an outstanding example of effective governance in the 2012 Indigenous Governance Awards by Reconciliation Australia.

AIM 2: Capacity Building.
Three full-time Aboriginal Project Officers (APOs) worked on the MRDPP-3, and each was awarded their Diploma of Community Nutrition. In addition one APO was awarded a Bachelor of Applied Science (Community Nutrition), another a Graduate Certificate of Diabetes Education, and all attained a range of complementary certificates. The APOs were the only qualified Aboriginal Community Nutritionists in NSW for the duration of the MRDPP-3, with few existing nationally. In addition to delivering the MRDPP, the Project Officers (located within the partner Aboriginal Medical Services) sat on National and State committees including the Aboriginal Education Support Group (AECG) and Food Standards Australia and New Zealand (FSANZ); made annual conference presentations; and conducted seminars at the request of the NSW AHMRC and other groups. The MRDPP has also employed and trained over 60 casual Aboriginal survey workers on the conduct of the research (including the population wide surveys). Collectively these capacity building strategies 'infused' knowledge about health risk factors into the participating communities; created a pathway to future employment; and "left a positive legacy" in the communities following the completion of the study activities. Support for such strategies was enabled through prioritising their implementation and resource provision by all partners to the MRDPP-3.

AIM 3: Determinants of healthy food intake and physical activity participation.
These were identified through focus groups with both Aboriginal and non-Indigenous community members; key barriers and strategies to address them are reported below.

Barriers to healthy eating include: poor availability of fresh, healthy foods and their high cost in rural areas (8); poor accessibility of healthy food due to distance of residential areas from shopping

centres; lack of private and public transport; ready accessibility of low-cost unhealthy food that is advertised targeting children; low family income; and poor parental knowledge about what constitutes healthy and unhealthy food.

Barriers to physical activity participation included: scarcity of sporting facilities; distance of sporting venues from residential areas; the high cost of participating in organised sport; lack/cost of private transport; poor public transport; parental role-modelling; and concerns around the safety of community play areas for children.

'Additional Barriers' reported by the Aboriginal community participants that related to both healthy eating and participation in physical activity included: experiences of racism in the general community; poor community cohesion; 'welfare dependency'; and low self-esteem. These factors were seen to impact across all the barriers listed above.

Strategies to encourage healthy food intake and participation in physical activity included: engaging Aboriginal people in local programs to address these factors; assisting parents to develop the self-confidence, skills and knowledge to support healthy behaviours in their children; and increasing the availability and accessibility of healthy food and physical activity facilities in regional areas.

Barriers to healthy food intake and physical activity participation identified here align with those found elsewhere within Indigenous, disadvantaged and rural communities (9, 10).

AIM 4: Description of the MRDPP-3 strategies that promoted healthy eating and physical activity.

Health promotion strategies were designed in collaboration with the participating communities; addressed children's diabetes knowledge, healthy food intake, and physical activity participation; were largely delivered in schools; and differed in levels of intensity (frequency, reach and duration). Please refer to Tables 2 and 3 in the Final Report for details which also include information on the strategies acceptability as well as barriers to their uptake.

The strategies delivered with the highest intensity were the school based nutrition strategies, followed by the school and club based physical activity strategies and finally the community level strategies.

1. ***School based Nutrition strategies:***
    a. Delivery of a Diabetes Education Package to primary and secondary schools which included a particular focus on encouraging less sugary drink consumption. This package was developed by one of the participating Aboriginal Medical Services, Durri ACMS in Kempsey
    b. Supporting "Crunch 'n Sip" (fruit and water intakes) and similar in primary schools.
    c. Supporting Breakfast Programs at schools, and other nutrition programs as requested.
    d. Supporting primary schools to establish vegetable and 'bush food' gardens.
2. ***School and Club based Physical Activity strategies:***
    a. Supporting "Get Skilled Get Active Go" (being more active) and similar in primary schools.

b. Traditional Indigenous Games – facilitating training of community members and students.
c. Midnight Basketball at PCYC for young Aboriginal people – Taree only.

3. Community level strategies addressing both Nutrition and Physical Activity:

a. Health Promotion information at annual Aboriginal community events such as the "NSW State Football Knockout", "Crocfest", "Elders Olympics" and "Young women's camps". MRDPP-3 promotions at these events particularly focussed on increasing fruit and water intakes.
b. Shire council geo mapping project – Kempsey only.

AIM 5: Impact of the MRDPP-3 Health Promotion Strategies

Study Design

The impact of the MRDPP-3 health promotion strategies on diabetes knowledge, food intake, physical activity levels and BMI of participants was evaluated by conducting a repeat cross-sectional pre-post design study.

Measures

Height, weight and waist circumference were measured and self-report surveys of diabetes knowledge, food intake and physical activity were administered. The measures of food intake (the Many Rivers Short Food Frequency Questionnaire (MRSFFQ) (11) and the measure of physical activity participation (Many Rivers Physical Activity Recall Questionnaire (MRPARQ) (12) had been validated previously by the research team within the participating communities. Both measures demonstrate that, given culturally appropriate support, Aboriginal and Torres Strait Islander children provide self-report data that is at least as valid as that of non-Indigenous children. The MRSFFQ can discriminate between different categories of food intake and provide information on relative intake (not actual) within both Aboriginal and non-Indigenous populations of rural children.

Participants

In the summer of 2007/8, 1620 children from school years 5-8 participated in Survey 1. Participants were 15% Aboriginal and 43% boys, with participation rates of 55% for Aboriginal and 41% for non-Indigenous children. Survey 2 was conducted in the summer of 2011/12 with 1035 children participating from school years 5-8; of those 23% were Aboriginal and 46% were boys, with participation rates of 41% for Aboriginal and 26% for non-Indigenous children.

Change in Diabetes Knowledge

No statistically significant difference was found between the two surveys in the proportions of either Aboriginal ($p=0.87$) and non-Indigenous children ($p=0.43$) correctly answering 90% of questions. Whilst no significant differences were found between gender for both surveys, a higher proportion of Aboriginal boys correctly answered 90% of the diabetes knowledge questions in 2011/12 (29%) than in 2007/8 (17%), representing a 70 % non-significant ($p=0.11$) relative improvement. In contrast, the

proportion of non-Indigenous boys that correctly answered 90% of the diabetes knowledge questions did not change.

Change in Consumption of Food and Drink

Results for the change in key food and drink intake of participants between the two surveys are summarised by Indigenous status in Table 1 (by gender) and Table 2 (with cut-points) below. The cut-points listed are based on Australian guidelines for fruit and vegetable intake, data distribution and expert opinion regarding food and drink intake levels of critical clinical significance (that is, those levels indicating excessive intakes of energy-dense nutrient-poor foods).

Change in reported intakes is most evident around drinks, fruit and vegetables. In summary, significantly more non-Indigenous children reported consuming less diet soft drink, fruit juice and sugary drinks in Survey 2 compared to Survey 1 (see Table 2 for p values). Aboriginal children's reported intakes of these drinks remained stable between surveys. However, when results are examined by gender, a higher proportion of Aboriginal girls reported consuming less fruit juice in 2011/12 than in 2007/8 (p=0.0001) and more Aboriginal boys reported consuming less diet soft drink (p=0.003). The proportions of Aboriginal children who reported meeting guidelines for fruit intake remained stable; however, fruit consumption reported by non-Indigenous children declined significantly. The proportion of all children who reported meeting guidelines for vegetable intake declined significantly (see Table 2) between Survey 1 and Survey 2.

Table 1: Change in children's reported consumption of key drinks and foods (to MORE children consuming LESS) by Indigenous status and gender between Survey 1 and Survey 2.

Food	Indigenous Status *Aboriginal (A) non-Indigenous (N)*	All	Boys	Girls
Sugary Drinks	N	■	■	■
	A			
Fruit Juice	N	■	■	■
	A			■
Diet Soft Drinks	N	■		■
	A		■	
Hot Chips	N			
	A			
HFPM [a]	N	■		
	A			
Fruit	N	■		
	A			
Vegetables	N	■	■	■
	A	■		■

■ *statistically significant difference p=0.05;* □ *no change ;* [a] *high fat processed meats*

Table 2: Change [1] in the proportion (%) of children's reported intake of key foods by Indigenous status between Survey 1 (2007/8) and Survey 2 (2011/12).

Foods	Cut-points	Indigenous Status *Aboriginal (A) non-Indigenous (N)*	2007/8	2011/12	p-value[2]
Sugary drinks	≥1 cup/day	N	15	14	0.02
		A	29	27	0.85
Fruit juice	≥1 cup/day	N	32	22	<0.0001
		A	37	30	0.26
Diet soft drinks	≥4 cups/week	N	8	7	0.001
		A	15	16	0.30
Hot Chips	≥5 times /week	N	4	5	0.40
		A	16	14	0.65
HFPM [3]	≥3 times /week	N	50	54	0.03
		A	54	52	0.88
Fruit [4]	≥2 serves/day	N	81	77	0.002
		A	76	76	0.55
Vegetables [4]	≥5 serves/day	N	15	8	<0.0001
		A	18	8	<0.0001

[1] Generalized Estimating Equations (GEE's) were used to examine differences between surveys, accounting for the correlation of children belonging to the same school, and p-values were derived from the Wald test; [2] statstically significant p< 0.05 level; [3] high fat processed meats; [4] cut-points represent Australian dietary guidelines for fruit and vegetable intake for this age-group.

Change in proportions meeting Australian Guidelines for Physical Activity

The proportion of the MRDPP cohort who reported meeting the Australian guidelines for moderate to vigorous physical activity (MVPA) declined significantly in 2011/12 compared with 2007/8 regardless of season or Indigenous status (Table 3).

Table 3: Proportion (%) of children in school years 5 to 8 who report meeting Australian Guidelines for daily physical activity between 2007/8 and 2011/12 by Indigenous Status.

Season	Aboriginal			non-Indigenous		
	2007/8 (n=246)	2011/12 (n=240)	p-value	2007/8 (n=1299)	2011/12 (n=683)	p-value
Summer	72	59	0.0015	79	70	0.0007
Winter	53	35	0.0002	59	50	0.0051

Change in Body Mass Index

Between 2007/8 and 2011/12 the prevalence of overweight and obesity remained stable with no significant changes across the BMI categories regardless of Indigenous status or gender (Table 4).

Table 4: Prevalence (%) in each BMI category 1 by gender and Indigenous status between 2007/8 and 2011/12.

Gender	BMI category	Aboriginal			Non-Indigenous		
		2007/8 (n=105)	2011/12 (n=118)	p-value	2007/8 (n=566)	2011/12 (n=330)	p-value
Boy	Underweight	2.1	5.2	0.38	2.2	2.5	0.70
	Healthy Weigh	63.0	63.0		70.0	71.0	
	Overweight	24.0	16.0		20.0	21.0	
	Obese	11.0	15.0		7.2	5.4	
Girl	Underweight	2.2	3.5	0.74	4.7	5.8	0.76
	Healthy Weigh	63.0	55.0		65.0	65.0	
	Overweight	22.0	24.0		22.0	21.0	
	Obese	13.0	18.0		8.9	8.0	

[1] *Body Mass Index (BMI) cateories according to Cole cut-off point.*

DISCUSSION

Food Intake: The changes in food intake align with the high intensity focus of the health promotion strategies on discouraging consumption of energy-dense nutrient-poor foods, particularly sugary drinks, and encouraging fruit intake. Changes also align with the high level of skills attained by the APOs in nutrition and in program delivery over the duration of the MRDPP-3. The findings for intake of sugary drinks, diet soft drinks and/or fruit juice in our cohort are in contrast to international trends which have seen a rise in the consumption of sugary drinks (13), as well as to some results for same age children from a NSW regional childhood obesity prevention program, 'Good4Kids' (G4K). The G4K study found no significant change in sugary drink or fruit juice intake for children in school years 6, 8 and 10. MRDPP-3 findings of stability in the proportion of Aboriginal children reporting meeting the guidelines for fruit intake are also in contrast to those for the same age children from the G4K program, which found a decline in the proportion of same age children reporting consuming the recommended intake. The decline in vegetable intake found here is in keeping with results from another NSW state survey (14). Results found here indicate that the food intake strategies may have had an effect. In the future similar programs should include robust evaluations such as using controlled or comparison groups to confidently establish their effectiveness.

BMI: The stability in the prevalence of children who are overweight and obese is similar to international trends which indicate that the increase in obesity that began over 25 years ago is attenuating in developed countries (15), according to national (16, 17) and state trends (18). Results for BMI are also similar to those for children of the same age participating in a regional obesity

prevention project (19). The result is not unexpected given the complex causal pathways to obesity (including environmental and intrauterine), the constraints on the delivery of the MRDPP-3 health promotion strategies (staffing levels and time frames) and an intervention that primarily focussed on school based nutrition.

Proportions of children who report meeting physical activity guidelines: The significant decrease between Survey 1 and 2 in the proportion of children who report meeting the Australian guidelines for physical activity aligns with regional, national and international (18) (20, 21) trends, and may reflect the lesser intensity of the MRDPP-3 physical activity health promotion activities and environmental barriers identified by the community (see AIM 3 Outcomes above). The suggested larger decrease in the proportion of Aboriginal children compared to their non-Indigenous counterparts meeting guidelines between 2007/8 and 2011/12 may be a consequence of the lower participation rate of non-Indigenous children in 2011/12 (26% compared with 41% in 2007/8). This may have resulted in the inclusion of a higher proportion of families in 2011/12 who were more motivated to healthy behaviours including participating in physical activity.

Importantly, the lower absolute participant numbers of Aboriginal children has meant that the study is underpowered to detect a change in this group.

Finally, over the MRDPP-3 intervention period there was a growth in state, national and international and childhood obesity prevention programs in response to the rapid rise in the prevalence of childhood obesity over past 15 to 20 years (17, 18). These may have confounded the evaluation of the MRDPP-3, however results suggest a positive impact on risk factors which received the highest intensity strategies.

PREVALENCE of key food intakes, physical activity participation, and BMI category.
Results from the MRDPP-3 also provide rare 'matched' prevalence data on key food intake levels, physical activity participation and BMI for Aboriginal and non-Indigenous children, and it is appropriate to report on these here.

Energy-Dense Nutrient-Poor (EDNP) food intake: Large differences by Indigenous status were found in the proportions of children reporting consuming high intakes of key EDNP foods across Surveys, in particular for sugary drinks and diet soft drinks and hot chips (See Table 2). These differences were first identified among similar aged children in 2005/6 in an earlier phase of the MRDPP (22), appear to be persisting over time and are of major concern for the future health of rural Aboriginal children. Significant differences in sugary drink intake by Indigenous status have recently reported at state level as well (23). High fat processed meats are consumed frequently by all children.

Fruit and vegetable intake: The proportions of Aboriginal children who report meeting the guidelines in Survey 1 and 2for fruit and vegetable intake, respectively, (see Table 2) are similar in magnitude to those reported in a 2012/13 national survey (78% and 16% respectively) of Aboriginal children aged 2-14 years (24), and to that of non-Indigenous children in this cohort (see Table 2).

Bread: The proportion of Aboriginal boys (88%) usually consuming white bread in both surveys was notably higher than for girls (76%) and for non-Indigenous children (boys 68%; girls between 66%

and 75%). Relatively high intake of poor quality white bread have been identified among Aboriginal boys from the communities who participated in previous phases of the MRDPP (22).

Proportions meeting the guidelines for physical activity participation: There is little comparative physical activity data for Aboriginal children nationally; however, it has been reported that Aboriginal people are more likely to engage in low levels of physical activity than their non-Indigenous counterparts (24). This study found that in 2007/8 the proportion of Aboriginal children who reported meeting guidelines was similar to non-Indigenous children, regardless of season (see Table 2). However in 2011/12, a difference became apparent, possibly as a result of the lower participation rate of non-Indigenous children in Survey 2. Internationally there is a consensus that far too few children meet activity guidelines (25, 26), with those from disadvantaged communities such as the ones participating in this study being notably less active (18).

Overweight and Obesity: The higher proportion of Aboriginal than non-Indigenous children classified as obese in this study, regardless of gender, is in accord with results from a national survey (24).

Risk factor prevalence and adolescent mental health: The persistently high intake of sugary drinks and hot chips by Aboriginal children along with the high proportion classified as obese is of concern for both their general and mental health. A recent study of Australian adolescents identified higher odds of depressive symptoms in girls who consumed high intakes of sugary drinks and in boys who were overweight or obese (27). However there are no studies published on these associations for Australian Aboriginal children.

CONCLUSIONS

The MRDPP-3 demonstrates that a long-term Aboriginal community governed collaboration can be developed and maintained, can deliver health promotion strategies to children in disadvantaged rural areas regardless of Indigenous status and may have an impact on risk factors when sufficiently high levels of strategy intensity and staff skills are available.

The MRDPP-3 delivered a number of positive outcomes in the participating communities and demonstrated that:

1. A program of research and health promotion for children initiated and governed by an Aboriginal community can be successfully developed and implemented. Outcomes can be measured using tools validated with the participating communities.
2. Strong local partnerships need to be formed to enhance program delivery. In this case partnerships were formed with schools, Police Citizens Youth Clubs, local shire councils and Aboriginal Medical Services.
3. A research partnership with Aboriginal communities can deliver:
    a. The development of high level skills in research and the delivery of a health promotion program by full-time Aboriginal staff.
    b. The employment and training of a large number of casual Aboriginal staff in the delivery of a population level health promotion program. This involvement can be a pathway to

more permanent employment elsewhere in disadvantaged rural areas, which possess chronically high levels of unemployment.

2. Barriers to healthy food intake and physical activity participation identified here align with those found elsewhere within Indigenous, disadvantaged and rural communities. Results presented here add to the national calls to address such findings. The 'Additional Barriers' reported by Aboriginal people require further investigation.
3. Non-Indigenous children can participate in and benefit from health promotion and education programs designed for Aboriginal children and delivered by members of the Aboriginal community.
4. The predominately school-based MRDPP-3 showed the following encouraging results amongst those who participated in Survey 2 when compared with those who participated in Survey 1:
    a. More non-Indigenous children reported consuming less sugary drinks, diet soft drinks and fruit juice in 2011/12 than 2007/8, with results differing by gender.
    b. More Aboriginal boys reported consuming less diet soft drinks and girls less fruit juice.
    c. A non-significantly a higher proportion of Aboriginal boys correctly answered 90% of the diabetes knowledge questions.
    d. Stability in the proportions of Aboriginal children regardless of gender who reported meeting the Australian guidelines for children over 9 years of age for fruit intake (2 serves/day). There was a significant decline in fruit intake by non-Indigenous children.
    e. Stability in the prevalence of children in the MRDPP-3 who were over the healthy weight range, with no significant changes apparent between the two surveys.

RECOMMENDATIONS

1. Aboriginal community governed research and/or health promotion projects for Aboriginal and non-Indigenous rural children have the potential to positively impact on stubborn health risk factors such as poor nutrition. To achieve positive change, such projects should have the following characteristics:
    a. *Aboriginal community governanc*e. A Community Based Participatory Research model should be adopted when undertaking research in collaboration with Aboriginal communities. Of particular importance is the establishment of Aboriginal community reference groups. It is recommended to include up to one extra year at the commencement of similar programs to support the establishment of governance procedures.
    b. *A strong emphasis on Capacity Building* activities. Sufficient time and funds for these activities must be built into the planning and execution of the project. Education and training should aim to contribute meaningful building blocks to staff members' skill development and future employability past the duration of their current role.
    c. Project strategies should be delivered by Aboriginal staff who are receiving *high levels of education / training* in the content being addressed - preferably at diploma or degree level.
    d. *Developed in partnership* with participating Aboriginal communities.

e. *Delivery in partnership* with local agencies to enhance the reach of project strategies into the participating communities.

f. *Include rigorous evaluation,* for example one that uses a controlled or comparison group, to establish effectiveness.

2. Governments need to develop a clear plan to address the barriers to healthy food intake and physical activity in rural areas such as those identified by the MRDPP-3 and by other studies nationally.

3. Further investigation is required to identify and explore the barriers to healthy food intake and physical activity identified by Aboriginal people in this study.

4. Prevalence and trend data from the MRDPP-3 provide strong evidence for the need to target the following risk factors for good health among rural children from disadvantaged communities:
    a. Persistently high intakes of sugary drinks, fruit juice, and hot chips by Aboriginal children.
    b. Very low reported vegetable intake by all children.
    c. Decline in children's physical activity.
    d. The ongoing higher proportion of Aboriginal children compared with non-Indigenous children who are classified as obese.

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