Dietary glycemic index and glycemic load amongst Indigenous and non-Indigenous children aged 10 – 12 years

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Abbreviations used: AHW – Aboriginal health workers; BGL – blood glucose level; CHO – carbohydrates; EDNP – energy dense nutrient poor; GI – glycemic index; GL – glycemic load; MRDPP – Many Rivers Diabetes Prevention Program; NSW – New South Wales; PAL – physical activity level; T2DM – type 2 diabetes mellitus.

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Abstract

Objective: This study aimed to estimate the dietary glycemic index (GI) and glycemic load (GL) of Australian Aboriginal and Torres Strait Islander and non-Indigenous rural children, and identify the main foods contributing to their GI and GL.

Research Methods and Procedures: A cross-sectional analysis of food intake of 215 children (38.1% were Aboriginal and Torres Strait Islanders) aged 10 – 12 years obtained by three 24-hour recalls was conducted. The foods were ranked according to their total contribution to total carbohydrates (CHO), GI and GL.

Results: Aboriginal and Torres Strait Islander participants have a significantly higher dietary GL (155.8 ± 46.8 vs 135.4 ± 31.2; $p < 0.001$) and GI (58.3 ± 3.9 vs 56.9 ± 3.8; $p = 0.008$) than the non-Indigenous participants. White breads were the main contributor of GI and GL in both groups, and were a main driver for the increasing GI. Fibre was not associated with GI, while sugar and starch were positively associated. Subjects with higher GI tended to be less physically active.

Conclusion: The quality of CHO in the diets of the participants was low, with poorer dietary items contributing most of the GI and GL. Substituting white breads with low / lower GI alternatives may be a useful strategy.

Keywords: dietary glycemic index, glycemic index, glycemic load, Indigenous Australian, Aboriginal and Torres Strait Islander

Introduction

Glycemic index (GI) and glycemic load (GL) have received considerable research interest in recent years, where a majority of studies reported increased risk of chronic diseases in people who followed a high GI / GL diet [1-7]. Of particular interest is the finding that chronic high dietary GI and GL increase the risk of type 2 diabetes (T2DM) [3]. It is believed that high GI foods are digested and released to the blood quickly, hence producing high postprandial blood glucose level (BGL) which may eventually lead to β-cell failure either by 'exhaustion', insulin resistance or toxicity to the β-cells [3, 8]. Switching from a high GI to a low-GI diet leads to improvement in a number of markers of insulin resistance, including insulin, C-peptide and HbA_{1c} [9, 10].

The relationship between GI/GL and increased risk of T2DM is particularly relevant for Indigenous peoples internationally as these populations have been shown to have a much higher prevalence of T2DM than their non-Indigenous counterparts - Australian Aboriginal and Torres Strait Islander adult and children have rates of diabetes of at least three [11] and six times [12] that of non-Indigenous Australians respectively. There is now strong evidence that the causes of T2DM include a complex interplay of social and environmental factors [13, 14], with poor nutritional status both *in utero* and childhood recognised as a key risk factor [15]. Similar to that of Indigenous populations internationally [13, 16], many Australian Aboriginal and Torres Strait Islander peoples possess a poor diet [17, 18], determinants include inadequate food access and availability [18], food security and financial stress [19, 20], with the latter identified as a substantial barrier to a healthy diet [20, 21].

The foods in the traditional diet of Australian Aboriginal and Torres Strait Islander peoples have been found to be digested and absorbed slowly, i.e. low GI, and are therefore possibly protective against type 2 diabetes [22]. European invasion, removal from traditional lands and forced dependence on handouts of staples such as white flour, sugar and rice have

largely contributed to the acquisition of a western diet that is often energy dense and nutrient poor (EDNP) [15]. Many Aboriginal and Torres Strait Islander people now consume carbohydrates that are highly refined as well as digested and absorbed quickly [21], i.e. high GI, thus increasing their risk of developing T2DM. Dietary GI and GL are therefore important markers for the risks of chronic disease in this population. There is no published study examining the dietary GI and GL of any Indigenous population internationally and for Australian Aboriginal and Torres Strait Islander children who are demonstrably at risk for T2DM. The aim of the present study is therefore to estimate the dietary GI and GL, as well as foods contributing to them, of the children who participated in the Many Rivers Diabetes Prevention Program.

Material and Methods

Study design and settings

A descriptive cross sectional analysis of children's dietary intake and physical activity was undertaken. The study was a component of the Many Rivers Diabetes Prevention Program (MRDPP). Further details of the study design, subject recruitment and data collection have been reported elsewhere [23, 24].

Subjects

Children in the 5th and 6th year of school (aged 10 to 12 years) at 11 selected primary schools were invited to participate in the study. In estimating the sample size required, a 5% significance level was assumed, as was 80% power, a design effect of 1.5 for clustering of children within schools, and a percentage of Aboriginal and Torres Strait Islander children of approximately 50 percent. With 250 children the study would be able to detect differences in nutrient intake between groups (by gender and Indigenous status) of approximately 0.5 of a standard deviation, and between Aboriginal and Torres Strait Islander and non-Indigenous children within each gender of 0.8 of a standard deviation.

Out of 259 healthy children recruited for the MRDPP, 256 children (111 boys, 145 girls) provided more than one day of 24 hour recall. About 40% of these children were Aboriginal or Torres Strait Islander (n = 102).

The study protocol was approved by the Hunter Area Health Service, the Mid North Coast Health Service, the University of Newcastle, the New South Wales (NSW) Department of Education and Training and the Aboriginal Health and Medical Research Council of NSW, Australia. Written informed consent from parents and child assent was a requirement for participation. The study was carried out in accordance with the principles of the Declaration of Helsinki as revised in 2000.

Data collection procedure

Physical activity data were self-reported by the respondent using the Many Rivers Physical Activity Recall Questionnaire (MRPARQ) [23]. This was recorded as metabolic equivalents of tasks (MET) and converted to physical activity levels (PAL). Eighteen respondents did not complete the MRPARQ, and a PAL of 1.6 was used as an estimated PAL for these participants in the plausibility assessment of energy intake (see below).

Food intake of the participants was obtained by multiple pass 24-hour recalls [25] as part of the MRDPP. The recalls were collected by research assistants and Aboriginal Health Workers (AHW), who had been trained in the technique by the study research nutritionist (VF). It was given as the mean intake of three days, including two weekdays and one weekend day. Four participants provided only two days of 24-hour recalls and were excluded from the analyses. Prompts such as food models and food packaging were used to assist children's recall.

The plausibility of the remaining food intake data were assessed using the Goldberg cut-off for specific PAL [26], and 31 implausible food intake data (23 under-reporters; eight over-reporters) were excluded from analysis. A further six food intake data with missing body

weight data were also excluded from analysis. Food intake data of 215 subjects (34 Aboriginal and Torres Strait Islander boys and 48 girls; 59 non-Indigenous boys and 74 girls; mean ± SD age of 10.9 ± 0.7 y) were included in the final analysis.

GI was assigned to the MRDPP food items by method described by us elsewhere [27]. The daily dietary GL of each subject was calculated as Σ GI (as %) × amount of CHO for the quantity of food consumed. The dietary GI was obtained by (dietary GL / total CHO intake in the day) × 100%. The mean daily dietary GI and GL for each participant were given by averaging the dietary GI and GL of the three recall days. The food items were ranked according to their contribution to total carbohydrates (CHO), dietary GI and GL.

Aboriginal and Torres Strait Islander children

Culturally appropriate support was provided to Aboriginal and Torres Strait Islander children throughout the study. AHW lived in the participating communities and were employed on the project to facilitate recruitment of Aboriginal and Torres Strait Islander children, and support their completion of all study procedures.

Statistical analysis

The normality of the data was tested using a Kolmogorov-Smirnov test, and variables identified as non-normally distributed were confirmed by a visual test on its distribution. Dietary GI was found to be normally distributed, and differences in GI between sex and Indigenous status were tested by a Student's *t*-test. Dietary GL and all food subgroup variables are not normally distributed, and hence an independent samples Mann-Whitney U-test was used to test for differences in mean GL between sex and Indigenous status; and mean percentage GL contribution, mean GL per capita, mean GL per consumer and mean GL per occasion between Aboriginal and Torres Strait Islander and non-Indigenous participants, stratified by gender. Gender and Indigenous status specific energy adjusted residuals of GI was calculated by linear regression, and was used to create energy-adjusted GI tertiles. Mean

percentage GL contribution, GL per capita for each GI tertile across GI tertiles, adjusted for age, sex, BMI and PAL, were calculated by multiple linear regression. Values were expressed as mean or percentage (with 95% Confidence Intervals) as appropriate. Due to the large number of zero values in the food subgroup variables, no transformation could improve the normality of these variables, and hence quantile regression, adjusted for age, sex, BMI and PAL, was used to test for trends across tertiles of GI to minimize the effect of the skewness of the data. This was performed using the 'qreg' procedure in STATA 11 (StataCorp, College Station, Texas, USA). All other analyses were performed using Statistical Packages for Social Science version 19.0 (IBM Australia, St Leonards NSW, Australia). All non-normally distributed continuous variables in **Table 4** except PAL, where only three levels were present, were log-transformed before fitting in the linear regression model for the *p* for trend analysis to improve normality. $P < 0.05$ was considered statistically significant.

Results

The mean (95% Confidence Intervals) dietary GI and GL of the study population were 57.5 (56.9 – 58.0) and 143.2 (138.0 – 148.5) respectively. No significant difference by sex was detected for dietary GI, and that for dietary GL was marginally non-significant ($p = 0.063$). The Aboriginal and Torres Strait Islander participants have a significantly higher dietary GL (155.8 vs 135.4; $p < 0.001$) and GI (58.3 vs 56.9; $p = 0.008$) than the non-Indigenous participants. There was no significant difference between the fibre intake between the groups while Aboriginal and Torres Strait Islander participants had a higher daily energy intake (8907.3 vs 8221.5; $p = 0.010$). Both Aboriginal and Torres Strait Islander boys and girls have a significantly higher dietary GL (168.1 vs 137.8; $p = 0.003$ and 147.1 vs 133.5; $p = 0.030$ respectively) than their non-Indigenous counterparts, but only the Aboriginal and Torres Strait Islander girls have a significantly higher dietary GI than the non-Indigenous girls (58.7 vs 56.7; $p = 0.007$). No difference by gender was found for GL.

Table 1 shows the mean CHO and GL contribution by the top 10 GL-contributing food subgroups. White breads contributed more than 13% of the participants' daily CHO intake, followed by sugar sweetened drinks, i.e. soft drinks and cordial, fruit juices and hot chips. White breads were also the main contributor of the dietary GL. Other major contributors were sugar sweetened beverages, hot chips, juices, and potatoes.

Table 2 shows the mean GL contribution by the top 15 GL-contributing food subgroups split by Indigenous status and gender. Mean per capita GL contribution of Aboriginal and Torres Strait Islander participants by white breads, soft drinks and hot chips were all significantly higher than that of non-Indigenous participants (all $p < 0.05$). However when examined by gender (**Table 3**), only the contribution by hot chips in boys remained significantly higher. Aboriginal and Torres Strait Islander girls were also having more GL from low sugar higher fibre breakfast cereals than non-Indigenous girls ($p < 0.05$). When only participants who had consumed those foods were analysed (per consumer), Aboriginal and Torres Strait Islander participants have significantly more of their dietary GL from white breads, hot chips and juices than non-Indigenous participants. Only the contribution by white breads in boys and fruit juices and hot chips in girls remained significantly higher when examined by gender.

Table 4 shows the mean daily intake of selected macronutrients and fibre by energy adjusted GI tertiles. Increasing trends were found for energy from CHO and intake of sugar and starch, while decreasing trends were found for energy from protein and fat. Subjects with higher GI appeared to have lower PAL. No significant trend was found for fibre across tertiles for all participants and when stratified by Indigenous status.

Table 5 shows the mean GL contribution by the top 15 GL-contributing food subgroups across energy adjusted GI tertiles. Participants who had a higher dietary GI had more of the percentage GL contributed by white breads, soft drinks, cordial and potatoes, and

the same trends were found for daily GL. When stratified by Indigenous status, similar trends exists for non-Indigenous participants except for white breads, while only the trend for white breads remained significant for percentage GL amongst Aboriginal and Torres Strait Islander participants.

Discussion

This is the first study to report the GI and GL of an Indigenous population. Both GI and GL of Australian Aboriginal and Torres Strait Islander rural children are statistically significantly higher than their non-Indigenous counterparts, with the difference in absolute amounts being notably higher for GL. Aboriginal and Torres Strait Islander children acquire a higher daily GL from poor dietary items than their non-Indigenous counterparts. Although it appears that dietary GI is at a moderate level for all participants (little data is available on appropriate levels for children), the foods contributing are poor dietary items including highly processed, quickly digested and absorbed foods such as white breads, soft drinks, hot chips, juices and potato crisps. These are considered poor dietary items as they are either low in fibre/nutrients, or high in sugar/energy, or both.

Mean dietary GI and GL is comparable to findings from a German study of 56 children aged 7 – 8 y [28], and another study of 720 Australian adolescents aged 14 y [29], however both studies only included non-Indigenous children, and the dietary GL reported in the latter study was notably lower than for the Aboriginal and Torres Strait Islander children in our study.

Dietary data for the Indigenous populations, both in Australia and internationally, is limited, let alone for Aboriginal and Torres Strait Islander children [30, 31]. In 2008, Longstreet *et al* similarly reported a high consumption of white bread, soft drink, potato and sweet biscuits/cookies amongst a cohort of overweight Australian (mainly females) Aboriginal and Torres Strait Islander adults [32]. Indigenous populations (especially children

and adolescents) from other countries were also reported to have poor dietary intake. For example, a study of 142 native Americans children aged 6 years or below reported low-nutrient-dense foods such as white breads and cakes accounted for 31% of their total daily energy intake [34]. In New Zealand, Māori adults and adolescents were found to be eating more bread and fewer vegetables; and more of them ate a larger than standard portion of cakes and desserts than their non-Indigenous counterparts [35, 36]. A Chilean study also reported that breads accounted for more than 50% of the total energy intake in vulnerable Indigenous children [37]. Breads used by these populations were likely to be white due to the high costs associated with wholemeal or mixed grain breads. The limited evidence suggests Indigenous populations around the world were facing challenges in maintaining good nutrition.

Children in this study population have dietary risk factors for the future development of T2DM [12]. Australian Aboriginal and Torres Strait Islander rural children appear to be consuming more poor dietary items than non-Indigenous children, possibly due to historical food access and availability barriers [18], to the effects of dispossession and social disadvantage [19], and to lifestyle factors that affect all children in countries similar to Australia [16]. More specifically, Aboriginal and Torres Strait Islander community members advising and working on this study and community focus groups conducted as part of this program of research [38] comment that the children in their community (and particularly boys) are hungry because Aboriginal and Torres Strait Islander children tend to be more active than their non-Indigenous counterparts at aged 10-12 years [23] and that providing foods such as white bread and fried potato chips is an affordable option to satisfy hunger [20, 21].

Our data suggested that the increase in white breads consumption was the main driver for the increasing dietary GI for Aboriginal and Torres Strait Islander participants,

while a range of foods were responsible for the increase in GI among non-Indigenous participants. Replacing white breads with low GI breads, such as mixed grain breads, may be an effective strategy to lower the dietary GI/GL amongst Aboriginal and Torres Strait Islander children. Strategies to promote nutrient dense foods (for example fruit and vegetables) and discourage the consumption of nutrient poor dietary items may also be of benefit.

Unfortunately, low/lower GI CHO choices such as mixed grain breads are often more expensive than the higher/high GI choices. For example, based on the average listed prices of the two leading supermarket chains in Australia, a loaf of home brand white bread could be obtained for as little as AU$1.1 while a loaf of mixed grain bread costs AU$2.0 (home brand) or more (other brands). Based on the estimation of the Queensland Healthy Food Access Basket study [39], a four-member family could save at least AU$18 per fortnight by choosing white bread over mixed grain bread. The difficulties of maintaining a healthy diet consistent with the Australian health recommendations for low income or welfare-dependant families has recently been argued [20]. Government subsidy on healthy low GI foods therefore represents a further strategy worthy of consideration, particularly for Aboriginal and Torres Strait Islander people where cost has been identified as an issue of major concern when making food choices [40].

One of the strengths of this study is the detailed and culturally appropriate dietary assessment, which was collected and supported by trained AHWs. We have collected data using a multiple-pass 24 hour recall method which asked the respondents about recent food intake rather than recalling long term food consumption frequencies. It has also been suggested that children aged eight years or older have markedly improved ability to provide recalls [41].

However, like any other studies utilizing 24 hour recalls, there may still be recall bias [42]. By using the Goldberg cut-off method [26], under- and over-reporters were excluded

from the analysis and thus increased the plausibility of the result, though we cannot exclude the possibility of the presence of systematic bias in the dataset. Also, since there was no complete published glycemic index database, there could be errors in the glycemic index values assigned to the food items [43], which ultimately affects the calculated GI/GL. However we have minimized the likelihood of this with careful assignment of GI to each item following published methods [27], and the assigned values were reviewed by an expert group.

While the small sample size in a selective population limits the generalizability of the findings, this study is the first to show the specific impact of nutrition transition in Australian Aboriginal and Torres Strait Islander children. Confirming the results of the present study in larger samples of Australian and international Indigenous children is therefore warranted.

To conclude, the quality of CHO in the diets of these children was low, with poor dietary items contributing most of the GL. These results provide information to guide future health programs which aim to lower GI and GL, and improve the quality of CHO in the diet of the population as a whole and that of Australian Aboriginal and Torres Strait Islander children in particular.

Authors' contribution

JG, VF and JW contributed to the conception of the study. NT, JC and JG collected the 24-hour recalls data. JG and VF designed the detailed dietary assessment study. JCYL performed the descriptive statistics analyses. JCYL and VF contributed to the assignment of glycemic indices, and interpreted the data. JCYL drafted the manuscript. All authors were involved in the subsequent edits of the manuscript, and read and approved the final manuscript.

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Declaration of competing interest

The authors declare they have no conflict of interest.

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Table 1 – Mean (95% Confidence Intervals) carbohydrate (CHO) and glycemic load (GL) contribution by the top 10 food subgroups

Subgroup	%CHO contribution (%)	%GL contribution (%)	Per capita daily GL contribution	Per consumer daily GL contribution	GL per eating occasion
White breads	13.9 (12.6 – 15.2)	17.0 (15.4 – 18.5)	24.2 (22.0 – 26.5)	27.3 (25.1 – 29.5)	22.4 (21.7 – 23.1)
Soft drinks	7.6 (6.5 – 8.6)	8.0 (6.9 – 9.1)	12.3 (10.5 – 14.2)	17.9 (15.7 – 20.1)	21.9 (20.9 – 23.0)
Hot chips	4.6 (3.9 – 5.3)	6.0 (5.1 – 6.8)	8.4 (7.1 – 9.6)	13.0 (11.6 – 14.4)	24.3 (22.6 – 26.0)
Juices, fruit drinks	6.0 (5.2 – 6.8)	5.3 (4.6 – 6.1)	7.7 (6.6 – 8.9)	10.8 (9.5 – 12.1)	12.0 (11.5 – 12.5)
Cordial drinks	3.9 (3.1 – 4.6)	4.4 (3.5 – 5.2)	6.3 (5.1 – 7.5)	12.7 (10.9 – 14.5)	7.0 (6.3 – 7.7)
Low fat potatoes	2.7 (2.3 – 3.1)	3.7 (3.1 – 4.3)	5.0 (4.3 – 5.8)	8.1 (7.2 – 8.9)	17.0 (15.6 – 18.4)
High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	2.8 (2.2 – 3.3)	3.5 (2.8 – 4.3)	5.1 (4.0 – 6.1)	11.9 (10.2 – 13.6)	20.5 (18.5 – 22.4)
Lollies	2.4 (1.9 – 2.9)	2.9 (2.3 – 3.5)	4.5 (3.5 – 5.5)	8.9 (7.3 – 10.5)	11.5 (10.3 – 12.8)
Potato crisps & other salty snacks	2.8 (2.4 – 3.2)	2.9 (2.5 – 3.2)	4.0 (3.4 – 4.5)	5.8 (5.2 – 6.4)	7.2 (6.8 – 7.5)
Cakes, slices and donuts	3.0 (2.3 – 3.6)	2.9 (2.2 – 3.6)	4.0 (3.0 – 4.9)	10.4 (8.6 – 12.1)	18.0 (15.3 – 20.7)

Table 2 – Mean (95% Confidence Intervals) glycemic load (GL) contribution by the top food subgroups by Indigenous status[a]

	GL contribution (%)		Per capita daily GL contribution		Per consumer daily GL contribution		GL per eating occasion	
Food Subgroup	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**
White breads	18.0 (15.4 – 20.7)	16.3 (14.5 – 18.1)	27.7 (23.6 – 31.8)	22.1 (19.4 – 24.8)*	31.5 (27.6 – 35.4)	24.7 (22.1 – 27.3)**	23.2 (22.1 – 24.4)	21.8 (21.0 – 22.6)
Soft drinks	9.4 (7.4 – 11.5)	7.0 (5.8 – 8.3)	15.7 (12.0 – 19.4)	10.3 (8.3 – 12.3)*	19.8 (15.8 – 23.9)	16.4 (14.1 – 18.8)	22.5 (20.8 – 24.1)	21.4 (20.0 – 22.8)
Hot chips	6.9 (5.5 – 8.3)	5.5 (4.3 – 6.5)*	10.4 (8.3 – 12.4)	7.2 (5.6 – 8.6)**	14.6 (12.5 – 16.8)	11.8 (10.0 – 13.7)**	25.5 (22.8 – 28.2)	23.3 (21.2 – 25.4)
Juices, fruit drinks	6.3 (4.9 – 7.6)	4.8 (4.0 – 5.6)	9.6 (7.3 – 11.8)	6.6 (5.5 – 7.7)	13.5 (10.9 – 16.1)	9.2 (7.9 – 10.4)**	12.3 (11.5 – 13.0)	11.7 (11.0 – 12.5)
Cordial drinks	4.6 (3.1 – 6.0)	4.3 (3.2 – 5.3)	7.0 (4.7 – 9.3)	5.9 (4.5 – 7.3)	13.7 (10.2 – 17.1)	12.0 (10.1 – 14.0)	6.6 (5.6 – 7.6)	7.3 (6.3 – 8.3)
Lollies	3.4 (2.4 – 4.3)	2.6 (1.8 – 3.3)	5.7 (3.9 – 7.4)	3.8 (2.6 – 5.0)	10.1 (7.6 – 12.6)	8.0 (5.9 – 10.1)	13.7 (11.6 – 15.7)	10.1 (8.5 – 11.6)***
High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	3.5 (2.6 – 4.5)	3.6 (2.6 – 4.6)	5.4 (3.9 – 6.9)	4.8 (3.4 – 6.3)	11.1 (9.3 – 12.8)	12.6 (9.9 – 15.3)	19.6 (17.1 – 22.0)	21.2 (18.3 – 24.1)
Low fat potatoes	3.5 (2.6 – 4.4)	3.8 (3.0 – 4.5)	5.2 (3.9 – 6.5)	4.9 (4.0 – 5.8)	8.5 (7.0 – 10.0)	7.8 (6.8 – 8.8)	18.2 (15.4 – 21.1)	16.3 (14.8 – 17.8)

	GL contribution (%)		Per capita daily GL contribution		Per consumer daily GL contribution		GL per eating occasion	
Food Subgroup	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**
Low sugar high fibre breakfast cereals (e.g. wheat flake biscuit)	3.0 (1.9 – 4.0)	2.4 (1.5 – 3.2)*	5.2 (2.6 – 7.7)	3.2 (2.0 – 4.4)*	11.4 (6.3 – 16.6)	11.0 (8.1 – 13.8)	18.9 (16.7 – 21.2)	18.6 (16.6 – 20.6)
Potato crisps & other salty snacks	3.1 (2.5 – 3.8)	2.7 (2.2 – 3.2)	4.8 (3.8 – 5.7)	3.5 (2.9 – 4.2)*	6.2 (5.2 – 7.2)	5.5 (4.8 – 6.2)	7.4 (6.9 – 7.9)	7.0 (6.5 – 7.5)
Sugar	1.7 (0.7 – 2.7)	1.4 (0.9 – 1.8)	3.8 (0.5 – 7.0)	1.9 (1.3 – 2.6)	7.2 (1.1 – 13.4)	4.4 (3.1 – 5.7)	11.5 (8.1 – 14.8)	6.5 (5.4 – 7.5)*
Pasta	2.2 (1.4 – 3.0)	1.9 (1.4 – 2.5)	3.2 (2.1 – 4.4)	2.5 (1.8 – 3.3)	8.0 (6.2 – 9.9)	6.8 (5.6 – 8.0)	17.7 (14.4 – 21.0)	16.9 (14.2 – 19.7)
Flavoured milk	2.0 (1.3 – 2.7)	1.5 (1.0 – 2.0)	3.0 (2.0 – 4.0)	1.9 (1.3 – 2.6)*	7.1 (5.5 – 8.7)	6.5 (5.1 – 7.9)	13.8 (11.9 – 15.6)	14.4 (12.1 – 16.7)
Cakes, slices and donuts	1.9 (0.9 – 2.8)	3.6 (2.7 – 4.5)**	2.9 (1.2 – 4.5)	4.6 (3.5 – 5.8)**	11.1 (6.1 – 16.2)	10.1 (8.4 – 11.9)	21.3 (11.9 – 30.7)	17.0 (14.8 – 19.2)
Higher fat processed meats	1.7 (1.2 – 2.2)	1.9 (1.4 – 2.4)	2.5 (1.8 – 3.2)	2.5 (1.9 – 3.1)	3.0 (2.2 – 3.8)	3.0 (2.3 – 3.7)	3.8 (3.0 – 4.6)	4.1 (3.4 – 4.8)

[a]82 Aboriginal and Torres Strait Islander, 133 non-Indigenous; 93 boys, 122 girls

Difference between groups tested by independent samples Mann-Whitney U test; *$p < 0.05$ and **$p < 0.01$ when compared to Aboriginal and Torres Strait Islander participants

Table 3 – Mean (95% Confidence Intervals) glycemic load (GL) contribution by the top food subgroups by Indigenous status and gender

	GL contribution (%)		Per capita daily GL contribution		Per consumer daily GL contribution		GL per eating occasion	
Food Subgroup	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**	**Aboriginal and Torres Strait Islander**	**Non- Indigenous**
***Boys* only (*n* = 82)[a]**								
White breads	17.3 (13.5 – 21.0)	16.7 (13.7 – 19.6)	29.5 (22.7 – 36.4)	23.2 (18.6 – 27.8)	33.5 (27.0 – 39.9)	25.8 (21.3 – 30.4)*	26.2 (23.8 – 28.6)††	23.6 (22.3 – 24.9)##
Soft drinks	9.2 (6.3 – 12.0)	7.6 (5.4 – 9.7)	16.6 (11.0 – 22.2)	10.9 (7.7 – 14.0)	21.7 (15.7 – 27.8)	18.3 (14.8 – 21.8)#	22.9 (20.3 – 25.6)	23.5 (21.2 – 25.7)##
Hot chips	8.1 (5.9 – 10.3)	5.6 (3.6 – 7.5)*	12.5 (9.1 – 15.9)	7.6 (4.8 – 10.2)**	15.8 (12.6 – 19.0)	14.3 (10.5 – 18.1)	27.2 (22.1 – 32.4)	25.1 (21.2 – 29.0)
Juices, fruit drinks	6.3 (4.2 – 8.5)	4.4 (3.2 – 5.6)	10.6 (6.7 – 14.4)	6.4 (4.6 – 8.1)	13.8 (9.5 – 18.1)	9.9 (7.9 – 11.8)	12.6 (11.5 – 13.6)	13.3 (11.9 – 14.6)###
Low sugar high fibre breakfast cereals (e.g. wheat flake biscuit)	3.9 (1.6 – 6.2)	3.9 (2.1 – 5.7)	7.8 (1.8 – 13.9)	5.4 (2.9 – 7.9)	16.7 (4.8 – 28.5)	16.0 (11.4 – 20.5)###	23.5 (19.7 – 27.3)†††	23.4 (21.2 – 25.5)###
High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	4.2 (2.5 – 5.8)	4.7 (2.8 – 6.6)	6.8 (4.0 – 9.5)	6.4 (3.6 – 9.2)	12.8 (9.7 – 15.9)	15.8 (10.9 – 20.8)#	23.0 (19.3 – 26.8)††	22.8 (18.1 – 27.5)
Cordial drinks	3.9 (1.9 – 5.9)	4.2 (2.7 – 5.6)	6.3 (3.1 – 9.5)	6.0 (3.8 – 8.1)	13.4 (8.5 – 18.3)	12.1 (9.1 – 15.1)	6.8 (5.2 – 8.5)	7.2 (5.8 – 8.7)
Low fat potatoes	3.9 (2.4 – 5.5)	3.7 (2.5 – 4.8)	5.8 (3.6 – 8.0)	4.8 (3.5 – 6.2)	10.3 (8.0 – 12.7)†	7.5 (5.9 – 9.1)*	19.6 (15.0 – 24.3)	16.4 (14.3 – 18.6)
Sugar	2.0 (-0.2 – 4.2)	1.4 (0.8 – 2.0)	5.5 (-2.2 – 13.3)	2.0 (0.9 – 3.1)	11.8 (-5.2 – 28.7)	4.2 (2.2 – 6.2)	16.1 (9.7 – 22.6)	6.2 (5.0 – 7.4)

Potato crisps & other salty snacks	2.9 (2.1 – 3.7)	2.6 (1.9 – 3.3)	5.0 (3.5 – 6.4)	3.4 (2.5 – 4.3)	6.3 (4.8 – 7.7)	5.6 (4.7 – 6.5)	8.2 (7.4 – 9.0)†	7.1 (6.3 – 7.8)
Lollies	2.6 (1.5 – 3.8)	2.1 (1.2 – 3.0)	4.8 (2.4 – 7.1)	3.1 (1.8 – 4.5)	10.1 (6.6 – 13.7)	7.1 (4.7 – 9.4)	14.7 (11.0 – 18.5)	9.3 (7.3 – 11.4)
Flavoured milk	1.7 (0.9 – 2.6)	1.2 (0.5 – 2.0)	3.0 (1.2 – 4.7)	1.6 (0.6 – 2.6)	7.2 (4.0 – 10.3)	6.9 (3.7 – 10.0)	13.7 (10.4 – 17.0)	15.2 (9.8 – 20.5)
Other breads	1.7 (0.2 – 3.2)	1.8 (0.7 – 5.8)	2.8 (0.7 – 5.0)	2.4 (1.0 – 3.9)	12.1 (5.9 – 18.2)	9.6 (5.4 – 13.8)	26.4 (16.7 – 36.0)	17.3 (12.8 – 21.9)
Higher fat processed meats	1.8 (1.0 – 2.5)	2.1 (1.3 – 3.0)	2.7 (1.5 – 3.9)	2.8 (1.8 – 3.9)	3.2 (1.9 – 4.4)	3.4 (2.2 – 4.5)	3.6 (2.5 – 4.7)	4.2 (3.1 – 5.3)
Pasta	1.6 (0.5 – 2.6)	2.0 (1.0 – 2.9)	2.5 (0.9 – 4.1)	2.6 (1.4 – 3.8)	6.2 (3.0 – 9.3)	7.6 (5.4 – 9.8)	17.2 (8.2 – 26.3)	19.1 (14.5 – 23.7)
***Girls* only (*n* = 133)[b]**								
White breads	18.5 (14.8 – 22.3)	16.0 (13.7 – 18.3)	26.4 (21.2 – 31.6)	21.2 (18.0 – 24.4)	30.2 (25.2 – 35.2)	23.8 (20.8 – 26.8)	21.4 (20.3 – 22.4)	20.5 (19.5 – 21.5)
Soft drinks	9.6 (6.7 – 12.5)	6.7 (5.1 – 8.2)	15.1 (10.1 – 20.1)	9.8 (7.1 – 12.4)	18.5 (12.9 – 24.2)	15.1 (11.9 – 18.3)	22.1 (20.0 – 24.3)	19.9 (18.2 – 21.6)
Juices, fruit drinks	6.2 (4.4 – 8.0)	5.1 (3.9 – 6.2)	8.8 (6.0 – 11.7)	6.8 (5.3 – 8.3)	13.3 (9.9 – 16.6)	8.7 (7.0 – 10.3)***	12.0 (11.0 – 13.0)	10.8 (9.9 – 11.6)
Hot chips	6.0 (4.2 – 7.9)	5.3 (3.9 – 6.5)	8.8 (6.2 – 11.5)	6.9 (5.2 – 8.4)	13.6 (10.8 – 16.5)	10.3 (8.5 – 12.1)*	23.9 (21.6 – 26.3)	22.0 (19.7 – 24.2)
Cordial drinks	5.0 (3.0 – 7.0)	4.3 (2.9 – 5.8)	7.5 (4.2 – 10.8)	5.8 (3.9 – 7.7)	13.9 (8.9 – 18.8)	11.9 (9.2 – 14.7)	6.5 (5.2 – 7.8)	7.4 (5.9 – 8.8)
Lollies	3.9 (2.4 – 5.3)	3.0 (1.8 – 4.1)	6.3 (3.8 – 8.8)	4.3 (2.4 – 6.2)	10.1 (6.6 – 13.5)	8.6 (5.4 – 11.9)	13.1 (10.6 – 15.7)	10.5 (8.3 – 12.7)
Low fat potatoes	3.2 (2.1 – 4.3)	3.9 (2.9 – 4.9)	4.8 (3.1 – 6.4)	5.0 (3.8 – 6.2)	7.4 (5.4 – 9.4)	8.1 (6.8 – 9.3)	17.2 (13.5 – 20.8)	16.1 (14.0 – 18.3)
Potato crisps and other salty snack	3.3 (2.3 – 4.2)	2.7 (2.0 – 3.5)	4.6 (3.3 – 5.9)	3.6 (2.7 – 4.5)	6.1 (4.7 – 7.6)	5.4 (4.4 – 6.5)	6.9 (6.3 – 7.5)	6.9 (6.3 – 7.5)

High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	3.1 (1.9 – 4.2)	2.7 (1.6 – 3.7)	4.4 (2.8 – 6.1)	3.6 (2.1 – 5.0)	9.7 (7.7 – 11.6)	9.7 (7.2 – 12.3)	16.8 (13.8 – 19.8)	19.2 (16.0 – 22.5)
Pasta	2.6 (1.5 – 3.8)	1.9 (1.2 – 2.5)	3.7 (2.1 – 5.3)	2.5 (1.6 – 3.4)	9.4 (7.1 – 11.7)	6.2 (4.8 – 7.6)*	17.9 (15.1 – 20.7)	15.5 (12.1 – 18.9)
Low sugar high fibre breakfast cereals (e.g. wheat flake biscuit)	2.3 (1.4 – 3.2)	1.1 (0.6 – 1.6)*	3.3 (2.0 – 4.5)	1.5 (0.8 – 2.1)*	7.4 (5.8 – 9.1)	5.7 (4.4 – 7.0)	14.2 (13.1 – 15.3)	11.6 (10.1 – 13.2)
Cakes, slices and donuts	2.1 (1.0 – 3.3)	3.7 (2.4 – 5.0)	3.1 (1.4 – 4.8)	4.7 (3.0 – 6.5)	9.9 (6.4 – 13.3)	10.3 (7.6 – 13.1)	17.8 (13.0 – 22.6)	16.7 (13.3 – 20.1)
Flavoured milk	2.2 (1.2 – 3.2)	1.7 (1.0 – 2.4)	3.1 (1.8 – 4.4)	2.1 (1.3 – 3.0)	7.0 (5.1 – 9.0)	6.3 (4.8 – 7.8)	13.8 (11.5 – 16.1)	13.9 (11.6 – 16.2)
Sugar	1.5 (0.8 – 2.3)	1.4 (0.7 – 2.0)	2.5 (1.0 – 4.1)	1.9 (1.0 – 2.8)	4.5 (1.9 – 7.1)	4.6 (2.8 – 6.4)	7.9 (4.7 – 11.2)	6.7 (5.0 – 8.4)
Higher fat processed meat	1.7 (1.0 – 2.3)	1.7 (1.1 – 2.4)	2.4 (1.4 – 3.3)	2.2 (1.5 – 2.9)	2.8 (1.7 – 4.0)	2.7 (1.9 – 3.6)	4.0 (2.9 – 5.1)	4.0 (3.1 – 4.9)

[a]34 Aboriginal and Torres Strait Islander; 59 non-Indigenous

[b]48 Aboriginal and Torres Strait Islander; 74 non-Indigenous

Difference between groups tested by independent samples Mann-Whitney U test; *$p < 0.05$, **$p < 0.01$ and ***$p < 0.001$ when compared to Aboriginal and Torres Strait Islander participants of the same sex; †$p < 0.05$ and ††$p < 0.01$ when compared to Aboriginal and Torres Strait Islander girls; #$p < 0.05$, ##$p < 0.01$ and ###$p < 0.001$ when compared to non-Indigenous girls

Table 4 – Daily intake of selected macronutrients and fibre and demographics by energy adjusted GI tertiles and Indigenous status

	T1	T2	T3	*p value**
All participants				
n	71	73	71	-
Dietary GI	53.3 (52.7 – 53.9)	57.8 (57.5 – 58.2)	61.2 (60.7 – 61.8)	-
Male (%)	49.3 (37.4 – 61.2)	34.2 (23.1 – 45.4)	46.5 (34.6 – 58.4)	0.152
Aboriginal and Torres Strait Islander (%)	38.0 (26.5 – 49.6)	39.7 (28.2 – 51.2)	36.6 (25.1 – 48.1)	0.929
BMI	20.2 (19.3 – 21.1)	19.1 (18.2 – 19.9)	19.9 (18.9 – 20.9)	0.544
Physical activity level	1.69 (1.65 – 1.72)	1.67 (1.63 – 1.70)	1.59 (1.55 – 1.63)	↓<0.001
Dietary GL	126.8 (119.6 – 134.0)	142.8 (136.3 – 149.3)	160.0 (148.5 – 171.6)	↑<0.001
Energy (kJ)	8475.5 (8091.1 – 8859.9)	8331.1 (7944.1 – 8722.1)	8644.8 (8155.7 – 9133.9)	0.560
Energy from carbohydrates (%)	47.4 (46.1 – 48.8)	50.7 (49.6 – 51.7)	51.1 (49.6 – 52.7)	↑<0.001
Energy from protein (%)	16.4 (15.7 – 17.1)	14.5 (13.8 – 15.1)	14.8 (14.1 – 15.6)	↓<0.001
Energy from fat (%)	35.5 (34.4 – 36.5)	34.4 (33.5 – 35.2)	33.6 (32.5 – 34.6)	↓0.001
Saturated fat (g)	36.0 (33.8 – 38.2)	34.9 (32.4 – 37.3)	33.7 (31.6 – 35.8)	↓0.015
Available carbohydrate (g)	236.9 (223.9 – 249.9)	247.5 (235.6 – 259.4)	262.5 (242.6 – 282.3)	↑0.004
Sugars (g)	125.8 (116.0 – 135.6)	129.1 (119.5 – 138.6)	134.2 (119.8 – 148.6)	↑0.030

	T1	T2	T3	*p value**
Starch (g)	110.1 (104.2 – 116.0)	117.5 (112.0 – 123.1)	127.2 (119.1 – 135.2)	↑<0.001
Fibre (g)	18.8 (17.2 – 20.3)	17.3 (16.2 – 18.3)	17.8 (16.5 – 19.1)	0.563
Aboriginal and Torres strait Islander participants				
n	27	28	27	-
Dietary GI	53.9 (52.9 – 54.9)	58.9 (58.5 – 59.3)	62.2 (61.3 – 63.0)	-
Male (%)	51.9 (31.7 – 72.0)	25.0 (7.6 – 40.7)	48.1 (29.4 – 70.6)	0.090
BMI	20.6 (18.7 – 22.4)	18.6 (17.5 – 19.8)	18.6 (17.3 – 19.8)	0.319
Physical activity level	1.70 (1.64 – 1.75)	1.65 (1.59 – 1.71)	1.63 (1.56 – 1.71)	↓0.038
Dietary GL	140.3 (128.1 – 152.6)	145.3 (134.2 – 156.5)	182.2 (157.4 – 207.0)	↑0.001
Energy (kJ)	9187.8 (8450.7 – 9924.8)	8230.2 (7627.4 – 8833.1)	9329.0 (8285.5 – 10372.5)	0.105
Energy from carbohydrates (%)	48.1 (45.7 – 50.6)	51.1 (49.5 – 52.7)	52.8 (50.3 – 55.3)	↑<0.001
Energy from protein (%)	15.8 (14.6 – 17.1)	14.3 (13.3 – 15.2)	13.8 (12.7 – 14.9)	↓0.001
Energy from fat (%)	35.4 (33.6 – 37.3)	34.2 (33.0 – 35.4)	33.1 (31.3 – 34.9)	↓0.010
Saturated fat (g)	39.1 (34.8 – 43.3)	33.6 (30.4 – 36.8)	35.6 (31.9 – 39.3)	0.510
Available carbohydrate (g)	259.1 (237.1 – 281.1)	247.2 (227.1 – 267.2)	294.9 (251.6 – 338.2)	↑0.003
Sugars (g)	138.5 (122.7 – 154.3)	128.1 (111.7 – 144.6)	153.3 (122.4 – 184.2)	0.091

	T1	T2	T3	*p value**
Starch (g)	119.4 (107.5 – 131.4)	118.2 (108.5 – 127.8)	140.5 (125.3 – 155.7)	↑<0.001
Fibre (g)	20.0 (16.5 – 23.5)	17.0 (15.1 – 18.8)	19.1 (16.3 – 21.8)	0.117
Non-Indigenous participants				
n	44	45	44	-
Dietary GI	52.9 (52.1 – 53.7)	57.1 (56.7 – 57.5)	60.7 (60.0 – 61.4)	-
Male (%)	47.7 (32.4 – 63.1)	40.0 (25.8 – 56.0)	45.5 (29.4 – 59.5)	0.752
BMI	19.9 (19.1 – 20.8)	19.3 (18.2 – 20.5)	20.8 (19.4 – 22.2)	0.075
Physical activity level	1.69 (1.65 – 1.73)	1.68 (1.63 – 1.73)	1.57 (1.51 – 1.62)	↓0.004
Dietary GL	118.5 (110.2 – 126.8)	141.5 (133.3 – 149.7)	146.2 (136.4 – 155.9)	↑<0.001
Energy (kJ)	8038.4 (7644.3 – 8432.5)	8394.6 (7868.9 – 8920.4)	8227.4 (7770.3 – 8684.5)	0.376
Energy from carbohydrates (%)	47.0 (45.4 – 48.7)	50.6 (49.0 – 52.1)	49.9 (48.0 – 51.8)	↑0.008
Energy from protein (%)	16.8 (15.8 – 17.7)	14.6 (13.7 – 15.5)	15.5 (14.5 – 16.5)	↓0.010
Energy from fat (%)	35.5 (34.2 – 36.8)	34.3 (33.1 – 35.6)	34.1 (32.8 – 35.3)	0.088
Saturated fat (g)	34.1 (31.7 – 36.6)	35.5 (32.0 – 39.0)	32.6 (30.1 – 35.2)	↓0.011
Available carbohydrate (g)	223.3 (207.9 – 238.7)	248.3 (233.2 – 263.5)	241.9 (224.8 – 259.0)	0.459
Sugars (g)	118.0 (105.6 – 130.4)	130.3 (118.2 – 142.4)	121.9 (108.4 – 135.3)	0.482

	T1	T2	T3	*p value**
Starch (g)	104.3 (98.5 – 110.2)	117.2 (110.1 – 124.2)	119.0 (110.3 – 127.6)	↑0.032
Fibre (g)	18.0 (16.7 – 19.4)	17.5 (16.1 – 18.9)	17.0 (15.7 – 18.4)	0.059

Values were expressed as mean (95% Confidence Intervals), except for male and Indigenous status, which were expressed as percentages (95% Confidence Intervals).

*For male (%) and Indigenous (%), *p* values were tested by Pearson's Chi square. All other *p* values represent *p* for trend tested by linear regression, adjusted for age, gender, BMI (except for trend of BMI) and PAL.

Arrows preceding *p* for trend indicate the direction of trend.

Table 5 - Glycemic load (GL) contribution by the top food subgroups by energy adjusted GI tertiles and Indigenous status

Food subgroups	Percentage GL contribution (%)				Per capita daily GL contribution			
	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}
All participants								
White breads	12.5 (11.4 – 13.5)	16.7 (15.6 – 17.8)	20.3 (19.3 – 21.2)	↑0.008	15.0 (13.6 – 16.5)	24.1 (22.6 – 25.5)	31.2 (29.1 – 33.2)	↑<0.001
Soft drinks	6.2 (5.6 – 6.8)	8.7 (8.2 – 9.2)	9.3 (8.7 – 9.9)	↑0.030	8.3 (7.3 – 9.3)	13.2 (12.4 – 14.0)	16.0 (14.8 – 17.3)	↑0.001
Hot chips	5.3 (4.9 – 5.6)	5.6 (5.1 – 6.1)	7.5 (7.2 – 7.9)	0.080	6.5 (6.2 – 6.9)	8.1 (7.3 – 8.8)	11.2 (10.7 – 11.8)	↑0.040
Juices, fruit drinks	5.8 (5.4 – 6.2)	6.4 (6.2 – 6.6)	3.6 (3.3 – 3.9)	↓0.030	7.3 (6.8 – 7.8)	9.6 (9.2 – 10.0)	5.7 (5.2 – 6.3)	0.144
Cordial drinks	3.2 (2.8 – 3.6)	4.6 (4.1 – 5.1)	5.8 (5.2 – 6.4)	↑<0.001	3.9 (3.3 – 4.4)	6.7 (6.0 – 7.5)	9.0 (8.0 – 9.9)	↑<0.001
Lollies	2.0 (1.8 – 2.2)	2.9 (2.6 – 3.1)	3.9 (3.5 – 4.3)	0.542	2.7 (2.4 – 3.0)	4.4 (4.0 – 4.7)	6.8 (5.9 – 7.6)	0.508
High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	3.0 (2.5 – 3.6)	3.9 (3.7 – 4.2)	3.3 (2.8 – 3.7)	1.000	3.3 (2.8 – 3.8)	6.4 (5.8 – 6.9)	4.8 (4.1 – 5.4)	1.000
Low fat potatoes	2.8 (2.6– 3.1)	4.1 (3.7 – 4.6)	4.5 (4.2 – 4.8)	↑0.005	3.4 (3.1 – 3.7)	5.7 (5.2 – 6.3)	6.5 (6.1 – 6.9)	↑0.023
Low sugar high fibre breakfast cereals (e.g. wheat flake biscuit)	2.1 (1.9 – 2.3)	2.8 (2.4 – 3.1)	2.3 (1.8 – 2.8)	1.000	2.4 (2.2 – 2.6)	4.0 (3.4 – 4.5)	4.7 (3.5 – 5.9)	1.000
Potato crisps & other salty snacks	3.1 (2.9 – 3.3)	3.0 (2.9 – 3.1)	2.6 (2.3 – 2.8)	0.807	3.7 (3.4 – 4.0)	4.4 (4.2 – 4.6)	3.9 (3.6 – 4.2)	0.725
Sugar	1.1 (0.9 – 1.3)	1.4 (1.3 – 1.5)	2.0 (1.7 – 2.3)	1.000	1.4 (1.2 – 1.7)	2.0 (1.9 – 2.2)	4.7 (3.7 – 5.7)	1.000
Pasta	2.5 (2.3 – 2.6)	1.6 (1.4 – 1.8)	1.4 (1.2 – 1.6)	1.000	3.0 (2.8 – 3.2)	2.3 (1.9 – 2.6)	2.3 (1.9 – 2.6)	1.000
Flavoured milk	3.0 (2.7 – 3.3)	1.2 (1.1 – 1.4)	1.0 (0.9 – 1.1)	1.000	3.6 (3.2 – 3.9)	2.0 (1.7 – 2.2)	1.8 (1.6 – 1.9)	1.000

Food subgroups	Percentage GL contribution (%)				Per capita daily GL contribution			
	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}
Cakes, slices and donuts	3.4 (3.0 – 3.9)	2.0 (1.8 – 2.3)	2.8 (2.5 – 3.2)	1.000	4.2 (3.7 – 4.6)	2.9 (2.5 – 3.3)	4.1 (3.6 – 4.7)	1.000
Higher fat processed meats	2.7 (2.4 – 3.1)	1.7 (1.6 – 1.9)	1.1 (1.0 – 1.2)	↓0.002	3.2 (2.9 – 3.5)	2.6 (2.4 – 2.9)	1.7 (1.5 – 1.9)	↓0.001
Aboriginal and Torres Strait Islanders participants								
White breads	8.8 (6.9 – 10.7)	21.2 (18.7 – 23.7)	20.6 (18.1 – 23.1)	↑0.007	12.1 (9.3 – 15.0)	30.0 (26.7 – 33.2)	36.8 (32.0 – 41.6)	↑<0.001
Soft drinks	10.1 (7.8 – 12.4)	8.4 (7.5 – 9.4)	10.2 (8.5 – 11.9)	0.428	15.2 (11.4 – 19.0)	13.0 (10.9 – 15.2)	20.8 (17.5 – 24.0)	0.337
Hot chips	8.3 (7.3 – 9.4)	5.4 (3.8 – 7.0)	7.2 (5.7 – 8.6)	0.587	11.8 (10.2 – 13.5)	8.2 (5.8 – 10.6)	11.9 (9.9 – 13.9)	0.406
Juices, fruit drinks	7.7 (6.2 – 9.2)	6.3 (4.9 – 7.6)	4.8 (3.2 – 6.4)	↓0.017	11.4 (8.9 – 13.9)	8.8 (6.9 – 10.8)	8.4 (5.4 – 11.4)	0.168
Cordial drinks	2.6 (1.4 – 3.8)	7.1 (5.7 – 8.4)	5.5 (3.4 – 7.5)	0.667	3.1 (1.9 – 4.2)	10.3 (8.4 – 12.2)	10.0 (6.1 – 13.9)	0.227
Lollies	3.1 (2.5 – 3.7)	2.5 (1.7 – 3.2)	4.8 (3.4 – 6.1)	0.747	4.5 (3.5 – 5.5)	4.2 (2.8 – 5.5)	9.2 (6.2 – 12.1)	0.640
High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	3.4 (2.3 – 4.5)	5.1 (4.2 – 6.0)	3.2 (2.1 – 4.2)	0.636	5.1 (3.4 – 6.8)	7.7 (6.3 – 9.1)	4.9 (3.3 – 6.6)	0.988
Low fat potatoes	3.1 (2.3 – 3.9)	4.2 (2.9 – 5.5)	3.8 (3.0 – 4.6)	0.165	4.3 (3.0 – 5.6)	6.0 (4.3 – 7.7)	6.5 (4.9 – 8.1)	0.228
Low sugar high fibre breakfast cereals (e.g. wheat flake biscuit)	3.1 (2.5 – 3.6)	2.7 (1.4 – 4.0)	3.3 (1.8 – 4.7)	↓<0.001	4.1 (3.4 – 4.9)	3.9 (2.0 – 5.8)	8.2 (4.2 – 12.2)	↓0.001
Potato crisps & other salty snacks	3.5 (2.8 – 4.2)	3.9 (2.2 – 4.5)	2.6 (2.0 – 3.2)	0.113	4.9 (3.9 – 5.9)	5.9 (4.9 – 6.9)	4.3 (3.4 – 5.1)	0.565
Sugar	0.9 (0.6 – 1.2)	1.1 (0.7 – 1.6)	3.7 (2.5 – 5.0)	0.570	1.2 (0.9 – 1.6)	1.7 (1.0 – 2.4)	10.0 (5.7 – 14.4)	0.460
Pasta	2.7 (1.7 – 3.7)	2.2 (1.3 – 3.2)	1.1 (0.6 – 1.6)	1.000	3.5 (2.3 – 4.7)	3.1 (1.9 – 4.4)	2.4 (1.3 – 3.6)	1.000

Food subgroups	Percentage GL contribution (%)				Per capita daily GL contribution			
	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}
Flavoured milk	3.6 (2.6 – 4.6)	1.6 (1.1 – 2.0)	1.5 (0.6 – 2.4)	↓0.023	4.8 (3.7 – 5.9)	2.6 (1.8 – 3.5)	2.8 (1.3 – 4.4)	↓<0.001
Cakes, slices and donuts	1.7 (1.0 – 2.4)	0.9 (0.6 – 1.3)	2.2 (0.7 – 3.7)	1.000	2.4 (1.4 – 3.4)	1.4 (0.8 – 2.0)	3.6 (0.7 – 6.6)	1.000
Higher fat processed meats	2.8 (2.3 – 3.3)	1.5 (1.0 – 2.0)	1.1 (0.8 – 1.3)	↓0.050	4.0 (3.1 – 4.8)	2.3 (1.5 – 3.1)	1.9 (1.3 – 2.4)	↓0.003
Non Indigenous participants								
White breads	12.6 (11.3 – 13.9)	15.4 (14.6 – 16.2)	19.8 (18.0 – 21.5)	0.289	14.7 (13.0 – 16.3)	21.6 (20.5 – 22.7)	27.6 (24.9 – 30.3)	0.062
Soft drinks	4.7 (4.1 – 5.2)	9.0 (8.1 – 9.9)	7.9 (6.8 – 9.0)	↑0.040	5.7 (4.9 – 6.4)	13.5 (12.1 – 14.9)	11.8 (9.9 – 13.7)	↑0.028
Hot chips	4.4 (3.7 – 5.1)	5.3 (4.6 – 5.9)	6.9 (5.9 – 7.9)	↑0.030	5.0 (4.3 – 5.7)	7.4 (6.5 – 8.3)	9.6 (8.3 – 11.9)	0.078
Juices, fruit drinks	5.6 (4.9 – 6.4)	5.4 (5.0 – 5.8)	3.6 (3.1 – 4.1)	0.399	7.0 (6.1 – 7.9)	8.1 (7.5 – 8.8)	5.0 (4.4 – 5.6)	0.830
Cordial drinks	2.6 (1.7 – 3.5)	4.6 (3.7 – 5.6)	5.5 (4.6 – 6.4)	↑0.035	3.1 (2.2 – 4.1)	6.8 (5.3 – 8.2)	7.7 (6.6 – 8.8)	↑0.004
Lollies	1.7 (1.3 – 2.1)	2.9 (2.5 – 3.4)	3.3 (2.6 – 4.0)	0.463	2.2 (1.6 – 2.7)	4.4 (3.7 – 5.0)	5.0 (3.8 – 6.3)	0.585
High sugar low fibre breakfast cereals (e.g. cocoa puffed rice)	3.4 (2.7 – 4.2)	3.3 (2.8 – 3.9)	3.1 (2.5 – 3.8)	1.000	3.4 (2.8 – 4.1)	5.6 (4.4 – 6.7)	4.3 (3.3 – 5.3)	1.000
Low fat potatoes	2.8 (2.3 – 3.3)	4.1 (3.4 – 4.8)	5.0 (4.5 – 5.4)	0.155	3.3 (2.8 – 3.9)	5.5 (4.6 – 6.5)	6.5 (6.0 – 7.0)	↑<0.001
Low sugar high fibre breakfast cereals (e.g. wheat flake biscuit)	2.1 (1.6 – 2.6)	2.1 (1.5 – 2.7)	1.8 (1.3 – 2.3)	1.000	2.4 (1.9 – 2.8)	2.9 (2.1 – 3.7)	2.6 (1.8 – 3.4)	1.000
Potato crisps & other salty snacks	2.7 (2.4 – 3.1)	3.0 (2.6 – 3.3)	2.3 (2.0 – 2.7)	0.247	3.0 (2.6 – 3.4)	4.2 (3.8 – 4.7)	3.2 (2.7 – 3.7)	0.119
Sugar	0.9 (0.7 – 1.3)	1.8 (1.5 – 2.1)	1.1 (0.7 – 1.5)	1.000	1.3 (0.9 – 1.7)	2.5 (2.1 – 2.9)	1.5 (1.0 – 2.1)	1.000

Food subgroups	Percentage GL contribution (%)				Per capita daily GL contribution			
	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}	GI Tertile 1	GI Tertile 2	GI Tertile 3	[a]p_{trend}
Pasta	2.1 (1.7 – 2.5)	1.9 (1.5 – 2.4)	1.0 (0.8 – 1.3)	1.000	2.5 (2.1 – 2.9)	2.8 (2.2 – 3.4)	1.3 (1.0 – 1.7)	1.000
Flavoured milk	2.5 (2.1 – 3.0)	1.5 (1.0 – 1.9)	0.6 (0.4 – 0.7)	1.000	2.8 (2.3 – 3.3)	2.1 (1.5 – 2.7)	0.9 (0.7 – 1.0)	1.000
Cakes, slices and donuts	4.0 (3.0 – 4.9)	2.2 (1.8 – 2.7)	4.1 (3.3 – 4.9)	1.000	4.6 (3.6 – 5.5)	3.1 (2.5 – 3.8)	5.5 (4.4 – 6.6)	1.000
Higher fat processed meats	2.9 (2.2 – 3.5)	1.7 (1.5 – 1.9)	1.2 (1.0 – 1.4)	0.138	3.2 (2.6 – 3.9)	2.5 (2.2 – 2.7)	1.7 (1.4 – 2.0)	0.270

Values were expressed as mean (95% Confidence Intervals). *P* for trend tested by quantile regression. All analyses included adjustments for age, sex, BMI and physical activity level.

[a]Arrows preceding *p* for trend indicate the direction of trend.