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A comparison of dietary estimates from the National Aboriginal and Torres Strait Islander Health Survey to food and beverage purchase data

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Abstract

Objective: We compared self-reported dietary intake from the very remote sample of the National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey (VR-NATSINPAS; n=1,363) to one year of food and beverage purchases from 20 very remote Indigenous Australian communities (servicing ~8,500 individuals).

Methods: Differences in food (% energy from food groups) and nutrients were analysed using t-test with unequal variance.

Results: Per-capita energy estimates were not significantly different between the surveys (899 MJ/person/day [95% confidence interval -152,1950] p=0.094). Self-reported intakes of sugar, cereal products/dishes, beverages, fats/oils, milk products/dishes and confectionery were significantly lower than that purchased, while intakes of meat, vegetables, cereal-based dishes, fish, fruit and eggs were significantly higher (p<0.05).

Conclusion: Differences between methods are consistent with differential reporting bias seen in self-reported dietary data.

Implications for public health: The NATSINPAS provides valuable, much-needed information about dietary intake; however, self-reported data is prone to energy under-reporting and reporting bias. Purchase data can be used to track population-level food and nutrient availability in this population longitudinally; however, further evidence is needed on approaches to estimate wastage and foods sourced outside the store. There is potential for these data to complement each other to inform nutrition policies and programs in this population.

Key words: store sales data, population nutrition, dietary assessment, Indigenous Australians, 24-hour recall

Poor diet is a major contributor to the disproportionate burden of preventable illness and chronic disease experienced by Indigenous Australians.[1] Until recently, in-depth information about the dietary intake of this population has been lacking. In 2012–13, the National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey (NATSINPAS) was conducted by the Australian Bureau of Statistics (ABS). The NATSINPAS survey, which collected food and beverage intake information using 24-hour dietary recalls, was the first to examine dietary intake information specific to the Indigenous Australian population at a national level.[2]

The findings of the NATSINPAS are valuable for their potential to inform food and nutrition policy and programs; however, there are some key limitations and gaps in the data. Energy under-reporting, misreporting and reporting bias are common issues of collecting self-reported dietary intake data,[3-7] and additional challenges can be present when working cross-culturally. In the Indigenous Australian population, these include language barriers (with English often being a second, third or fourth language), low literacy and/or numeracy levels, cultural norms (such as reluctance to respond to direct questioning or to questioning of individual behaviour, fear of shame, and cultural law regarding communication between individuals), different perceptions of time and/or low acceptance of the value of measuring diet quantitatively.[6] In the NATSINPAS, the ABS estimated that energy intake was under-reported by as much as 24% for males and 31% for females.[8] Although it is accepted that misreporting is unlikely to apply to all foods equally, identifying where misreporting specifically occurred in the NATSINPAS was not possible.[2] Representativeness of the findings for usual dietary intake of Indigenous Australians may have been reduced by employment of a single 24-hour recall in those living remotely (56% of NATSINPAS sample) and under-representation of data collected on weekends. Finally, discretionary salt intake was not quantified in this survey, meaning sodium and iodine intakes were likely to be underestimated by approximately 20%.[9]

Population-level food and nutrient availability can be assessed by collection of food and beverage purchase data. These data are increasingly being used to monitor the food supply and assess impact of nutrition-related policies and programs. Examples of this from

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recent years include using food and beverage sales data to assess population exposure to specific nutrients such as such sodium, iodine and saturated fat in the United Kingdom,[10] New Zealand,[11] and the United States;[12] assess exposure to health claims in Slovenia;[13,14] monitor impact of a tax on sugar-sweetened beverages in Mexico;[15] calculate the energy density of the diet in Scotland;[16] inform tailored education resources;[17] and assess the effectiveness of store-based interventions.[18-20] Food and beverage purchase data are objective, therefore not prone to the biases associated with self-reported data.[21-23] They can be collected through a number of methods, including collecting electronic point-of-sale data (from retailers), market research surveys or from records collected or retained by consumers (such as receipts).[21] While the cost of obtaining such data can vary greatly, electronic-point of sales purchasing data, where available, can be collected and analysed cost-effectively, relative to self-reported data and with lower burden on individuals.[23] This allows for more frequent or ongoing monitoring of food and beverages purchases than is often possible with self-reported surveys.[21]

In 2012–2013, as part of the baseline period for the 'Stores Healthy Options Project in Remote Indigenous Communities' (SHOP@RIC), we collected store purchase sales data on all foods and beverages purchased from the community stores of 20 very remote Indigenous communities (servicing ~8,500 individuals) to indicate usual food and nutrient availability.[24] These data were collected in the same time period as the NATSINPAS, providing a unique opportunity to compare estimates from two very different dietary assessment methods. To the authors' knowledge, there have been no published statistical comparisons of population-level self-reported dietary data to food and beverage purchase data. Therefore, the aim of this study was to compare these datasets, and to provide potential insight into the evidence gaps from the NATSINPAS, and discuss evidence gaps and future directions for potential of food and beverage purchase data for monitoring population nutrition.

Methods

Food and beverage purchase data collection

This analysis used 12 months of electronic point-of-sale purchase data on all foods and drinks sold during the baseline period (July 2012 to June 2013) of the SHOP@RIC study.[24] This study included 20 very remote Indigenous communities located in the Northern Territory of Australia. Inclusion criteria were communities with a population of ≥100 residents, a community store managed by either Arnhem Land Progress Aboriginal Corporation (ALPA; eight communities) or Outback Stores (OBS; 12 communities), and without another food retail store within 20 kilometres. Population characteristics (age, gender and ethnicity distribution) for the 20 communities are shown in Supplementary Table 3. This study was conducted per the guidelines laid down in the Declaration of Helsinki and all procedures related to food and beverage purchase data collection were approved by the human research ethics committees of Northern Territory Department of Health and Menzies School of Health Research (HREC-2012-1711); Central Australia (HREC-12-13) and Deakin University (HREC-2012243). Written consent was obtained from the relevant store board representatives.

Food and beverage purchase sales data on all food and beverage items purchased at the store (and, where applicable, the associated takeaway food outlet) were collected by ALPA and OBS. Data (product codes, quantities sold and weight) were imported into a purpose-built Microsoft Access database (the Remote Indigenous Stores and Takeaways tool).[23] Food and beverage items were matched to a food identification code from the Australian Food and Nutrient survey specific database (AUSNUT 2011-13),[25] with assistance from Food Standards Australia and New Zealand (FSANZ). The food identification codes link to nutrient data[25] and a food grouping system.[26] Where necessary, volumes were converted to weights by multiplying the unit volume by the specific gravity.[25] Product weights were adjusted to reflect the edible portion by multiplying the unit weight by the edible portion.[25]

NATSINPAS data collection

In-depth methods for the NATSINPAS are available in the users' guide.[8] Briefly, 2,900 private dwellings were randomly selected across Australia (including remote and non-remote areas) to participate in the NATSINPAS, with a 79% response rate.[2] Between August 2012 and July 2013, trained ABS interviewers collected a single 24-hour dietary recall on all foods and beverages consumed on the day prior to the interview in person from one adult and one child in each selected household.[8] There was a lower proportion of 24-hour recalls collected on Sunday (4%) and Saturday (10%) versus weekdays (Monday 17%, Tuesday 20%, Wednesday 18%, Thursday 18% and Friday 14% – data provided by ABS). Dietary intake was collected using a 5-step automated multi-pass method, modified from the method developed by the Agricultural Research Service of the United States Department of Agriculture.[27] As part of this method, specific prompts were given for a selection of specific foods (including beverages, sweets, snacks, fruit, vegetables, cheese and bread) to remind participants of foods that may have been forgotten. A 'Bush Tucker Prompt Card' and a food model booklet were used to prompt participants about wild-harvested foods they may have consumed and to assist with portion size estimation, respectively.[8]

Reported foods and beverages were categorised by the ABS with assistance from FSANZ according to the Australian Health Survey Food and Supplement Classification system[26] and linked to nutrient data from AUSNUT 2011-13.[25] Dietary intake estimates were weighted by population benchmarks (age, sex and area of usual residence).[8]

Aggregate NATSINPAS dietary data from remote and non-remote Indigenous Australians are available online.[2] Aggregate data from only the 'very remote' Indigenous Australian population (including mean daily nutrient intake and proportion of energy from food groups) were requested from the ABS for the purpose of this analysis, to align the very remote SHOP@RIC population. The resulting dataset provided by ABS was aggregate population weighted data based on a single 24-hour recall from 1,363 individuals residing in very remote Australia (VR-NATSINPAS).

Statistical methods

Aggregate data from the VR-NATSINPAS included per capita nutrient intakes (weighted mean and relative standard error) and proportion of energy from food groups (weighted mean and margin of error). Relative standard error and margin of error estimates were converted to 95% confidence intervals (95% CIs) as per ABS explanatory notes.[8]

For food and beverage purchase data, daily per capita nutrient availabilities were calculated by dividing the total nutrient contents of all foods and drinks purchased over the study period by the population (total number of people living in each of the 20 included communities aged over one year drawn from census data)[28] and the total number of days sales data were collected. Mean and 95% CI food and nutrient estimates from purchase data were weighted by the population in each community.

Differences between datasets were calculated using t-tests with unequal variance. All data analyses were conducted in STATA (Version 13.1, College Station, TX, USA).

Results

Table 1 shows the per capita nutrient estimates for each dataset. While mean per capita energy availability from food and beverage purchase data was substantially higher than that reported in the VR-NATSINPAS, the difference did not achieve statistical significance. There were, however, significant differences in some macronutrients (Table 1). Carbohydrate and sugar estimates were significantly higher in purchase data (94g [95%CI 51,137] *p*=<0.001; 80g [56,104] *p*=<0.001), respectively, while protein was significantly lower (-28g [-39,-17] *p*=<0.001). Total fat estimates were similar, however poly-unsaturated fat was higher in purchase data (2g [1,3] *p*=0.001). This was due to higher estimates of linoleic and alpha-linoleic acid (1.7g [0.7,2.7] *p*=0.001 and 0.54g [0.38,0.70] *p*=<0.001, respectively), while omega-3 estimates were lower in stores purchase data (-217mg [-285,-149] *p*=<0.001). As expected, there were significant differences in sodium and iodine estimates with sodium being 649mg (356,942; *p*=<0.001) or 33% higher, and iodine being 62µg (38,86; *p*=<0.001) or 45% higher in the purchase data compared to VR-NATSINPAS. There were also considerable differences in some other micronutrients, with potassium (-364 mg [-585,-143] *p*=0.001), phosphorus (-237 mg [-378,-96] *p*=0.001), selenium (-20 µg [-31,-9] *p*=<0.001) niacin equivalents (-12 mg [-16,-8] *p*=<0.001), zinc (-3.6 mg [-5.0,-2.2] *p*=<0.001), vitamin B12 (-2.2 µg [-2.9,-1.5] *p*=<0.001) and Vitamin B6 (-0.22 mg [-0.37,-0.07] *p*=0.003) being lower in purchase data, while estimates of folate (182 µg [81,283] *p*=<0.001), calcium (99 mg [29,169] *p*=0.006), thiamine (0.41 mg [0.17,0.65] *p*=0.001), and vitamin E (1.4 mg [0.3,2.5] *p*=0.015) were higher (Supplementary Table 1).

There was a significantly higher proportion of energy from sugar products and dishes, cereals and cereal products, non-alcoholic beverages (mostly soft drinks), fats and oils (mostly margarine), milk products and dishes (mostly milk) and confectionery and cereal/nut/fruit/seed bars (mostly chocolate) in the food and beverage purchase data versus VR-NATSINPAS (Figure 1 and Table 2). There was a significantly lower proportion of energy from meat/poultry/game products and dishes, vegetable products and dishes (mostly potato), cereal-based products and dishes, fish and seafood products and dishes, fruit products and dishes, and egg products and dishes (mostly eggs) in the food and beverage purchase data versus VR-NATSINPAS.

Table 1: Comparison of nutrient intake/exposure from VR-NATSINPAS and food and beverage purchase data.

Nutrient	VR-NATSINPAS	Purchase data	Difference	P
Energy (kJ)	7633 (7170,8097)	8532 (7525,9540)	899 (-152,1950)	0.094
Macronutrients				
Protein (g)	91 (83,99)	63 (55,71)	-28 (-39,-17)***	<0.001
Fat (g)	61 (58,65)	63 (56,69)	2 (-5,9)	0.576
Saturated (g)	24 (23,26)	24 (22,26)	0 (-3,3)	1
Monounsaturated (g)	23 (22,25)	24 (21,26)	1 (-2,4)	0.489
Polyunsaturated (g)	8 (7,9)	10 (9,11)	2 (1,3)**	0.001
Trans (mg)	1458 (1281,1635)	1220 (1083,1358)	-238 (-457,-19)*	0.033
Carbohydrate (g)	208 (191,224)	302 (260,344)	94 (51,137)***	<0.001
Sugar (g)	89 (79,99)	169 (146,192)	80 (56,104)***	<0.001
Fibre (g)	15 (14,16)	18 (15,20)	3 (1,5)*	0.013
Minerals				
Iodine (µg)	137 (127,146)	199 (176,222)	62 (38,86)***	<0.001
Sodium (mg)	1975 (1824,2126)	2624 (2355,2892)	649 (356,942)***	<0.001

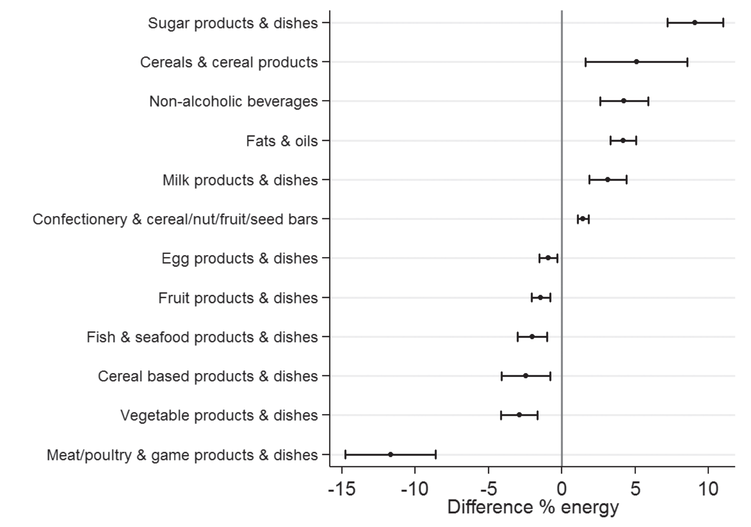
*Note: VR-NATSINPAS = very remote sample of National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey; Purchase data = Food and beverage purchase data from 20 very remote Indigenous Australian communities; * = p<0.05; ** = p<0.01; *** = p<0.001. Difference is SSD - VR-NATSINPAS analysed using t-test with unequal variance. See supplementary table S1 for all nutrients*

Discussion

We compared two methods of measuring population diet in the very remote Indigenous Australian population. We found that some discretionary food groups, including table sugar, soft drinks, sweet biscuits, processed meats and cordials, were higher in food and beverage purchase data than the VR-NATSINPAS. In contrast, the proportion of energy from fruit, vegetable and meat food groups were less than half of that reported in the VR-NATSINPAS. The discrepancies in types of foods were reflected by differences in some per capita nutrient estimates including protein, total carbohydrate and sugar.

This comparison suggests that the actual dietary intake of Indigenous Australians living in very remote Australia may be less adherent to the Australian Dietary guidelines than that indicated by the NATSINPAS, with higher intake of discretionary foods and sugar, and

Figure 1: Difference in proportion energy from major food groups.



Note: Major food groups[26] that provide >2% of total energy for either of the methods are shown. Difference is food and beverage purchase data minus very remote sample of National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey.

lower intakes of most of the five core food groups, protein and some key micronutrients. These differences are consistent with those expected from over- and under-reporting in dietary surveys. It has been well-recognised that foods high in sugar and fat are likely to be under-reported while fruit, vegetable and protein-rich foods are most likely to be over-reported.[3-7] Lee et al. compared 24-hour recall to weighed dietary intake (combined with observation) in 36 individuals from two very remote Indigenous Australian communities.[6] Foods most likely to be omitted in recall were 'discretionary foods', while items most likely to be added were wild-harvested foods, fruit and vegetables. The authors concluded that "relative to weighed dietary intake, the 24-hour recall method tended to over-estimate the intake of protein, fat and most vitamins and minerals, and under-estimate intake of refined and complex carbohydrate",[6] which is mostly consistent with our comparison of self-reported intake and food/drink purchases in the present study. Lee et al. also found that using store derived data to estimate dietary intake was the most acceptable to community members, and that estimated intake of most nutrients using this method lay within the 95% confidence intervals of weighed intake.[6]

Energy under-reporting is common with self-reported dietary intakes; a pooled analysis of five studies comparing energy intake from 24-hour recall found that energy intake was under-reported by 15% (range between individual studies 6–28%) when compared to doubly labelled water.[29] We previously calculated a population-weighted estimated energy requirement of 8.9MJ/day.[19] Per capita energy estimates from the food and beverage purchase sales data were 96% [95%CI 85-108%] of the estimated energy requirement, while estimates from the VR-NATSINPAS were 86% [81-91%]; however, the difference in estimated energy did not achieve statistical significance. Per capita energy estimates may have been underestimated in the food and beverage purchase data due to not collecting data on alcohol beverages (although most included communities have restrictions on alcohol sales) and foods sourced outside the store.

Limitations and evidence gaps for estimating population diet with purchase data

There are some key limitations of using food and beverage purchase data as a surrogate for population dietary intake. It is difficult to estimate the contribution of foods sourced outside of the store, such as from other service providers/food vendors or wild-harvested foods, to usual dietary intake. Communities included in the present study did not have food vendors in the community outside of the primary store, and the median distance to the nearest competitor was 81.5 km (range 25–443 km), which increases the likelihood that most food and beverage purchases were captured. Further we have previously analysed the proportion of food sourced from within community stores compared to other service providers (including school and aged care programs) in three very remote Indigenous communities and found that ~98% of energy was derived from stores compared to other vendors, although this study did not measure wild-harvested foods.[30]

The contribution of wild-harvested foods to the modern day Indigenous Australian diet is difficult to quantify. There is little current information on the types and amounts of wild-harvested foods consumed by this population, although the contribution to energy is likely to be small at the population-level.[6] Lee et al. estimated that traditional foods contribute less than 5% of energy intake.[31] In the VR-NATSINPAS, only 2.5% of energy came from wild-harvested food categories (all from the wild-harvested meats; Supplementary Table 2); however, the NATSINPAS did not specifically aim to document wild-harvested versus commercially obtained foods. Foods that fall within 'wild-harvested' categories are those reported as being consumed in the NATSINPAS for which there was not a

Table 2: Comparison of food groups (percentage energy from major and sub-major food groups) using VR-NATSINPAS and food and beverage purchase data.

Food group	VR-NATSINPAS	Purchase data	Difference	P
Cereals & cereal products	23.2% (20.3-26.1)	28.3% (26.3,30.3)	5.1% (1.6,8.5)**	0.004
Regular breads/rolls	11.4% (10.1-12.7)	13.5% (12.4,14.7)	2.1% (0.4,3.8)*	0.013
Flours & other cereal grains/starches	4.8% (3.2-6.4)	10.3% (8.4,12.1)	5.5% (3.1,7.8)***	<0.001
Pasta/pasta products (without sauce)	2.3% (0.8-3.8)	2.6% (2.3,2.8)	0.3% (-1.2,1.8)	0.724
Breakfast cereals/ready to eat	2.8% (2.1-3.5)	1.7% (1.5,2.0)	-1.1% (-1.8,-0.3)**	0.005
Sugar products & dishes	3.5% (2.9-4.1)	12.6% (10.6,14.5)	9.1% (7.2,11.0)***	<0.001
Sugar/honey & syrups	3.1% (2.5-3.7)	11.4% (9.3,13.4)	8.3% (6.2,10.3)***	<0.001
Meat/poultry/game products & dishes	23.2% (20.3-26.1)	11.5% (10.4,12.6)	-11.7% (-14.8,-8.6)***	<0.001
Beef/sheep/pork unprocessed	7.5% (5.4-9.6)	4.0% (3.4,4.5)	-3.5% (-5.7,-1.4)**	0.001
Processed meat	1.8% (1.3-2.3)	2.9% (2.4,3.4)	1.1% (0.4,1.8)**	0.001
Poultry/feathered game	2.4% (1.7-3.1)	2.4% (1.7,3.1)	0.0% (-1.0,1.0)	0.971
Mixed dishes (poultry/feathered game)	2.9% (1.9-3.9)	0.7% (0.5,1.0)	-2.2% (-3.2,-1.1)***	<0.001
Mixed dishes (beef/sheep/pork/game)	4.0% (2.5-5.5)	0.6% (0.4,0.8)	-3.4% (-4.9,-1.9)***	<0.001
Non-alcoholic beverages	6.9% (5.8-8.0)	11.1% (9.8,12.4)	4.2% (2.6,5.9)***	<0.001
Soft drinks/flavoured mineral waters	3.6% (2.6-4.6)	6.8% (5.9,7.7)	3.2% (1.9,4.5)***	<0.001
Cordials	1.3% (0.8-1.8)	2.3% (1.8,2.8)	1.0% (0.3,1.7)**	0.006
Milk products & dishes	7.4% (6.5-8.3)	10.5% (9.6,11.5)	3.1% (1.8,4.4)***	<0.001
Dairy milk (cow/sheep/goat)	4.7% (4.1-5.3)	7.5% (6.7,8.4)	2.8% (1.9,3.8)***	<0.001
Cereal based products & dishes	11.6% (10.3-12.9)	9.1% (8.0,10.2)	-2.5% (-4.1,-0.8)**	0.003
Sweet biscuits	1.7% (1.0-2.4)	3.1% (2.7,3.4)	1.4% (0.6,2.1)***	<0.001
Pastries	2.7% (2.0-3.4)	2.8% (2.1,3.4)	0.1% (-0.9,1.0)	0.895
Mixed dishes (cereal)	4.1% (3.1-5.1)	2.1% (1.8,2.5)	-2.0% (-3.0,-0.9)***	<0.001
Cakes/muffins/scones/cake-type desserts	2.6% (1.9-3.3)	0.8% (0.7,1.0)	-1.8% (-2.5,-1.1)***	<0.001
Fats & oils	2.0% (1.6-2.4)	6.2% (5.3,7.0)	4.2% (3.3,5.0)***	<0.001
Margarine & table spreads	1.0% (0.7-1.3)	4.1% (3.7,4.4)	3.1% (2.6,3.5)***	<0.001
Confectionery & cereal/nut/fruit/seed bars	1.0% (0.7-1.3)	2.4% (2.2,2.7)	1.4% (1.1,1.8)***	<0.001
Vegetable products & dishes	4.8% (3.6-6.0)	1.9% (1.5,2.3)	-2.9% (-4.2,-1.7)***	<0.001
Potatoes	3.4% (2.2-4.6)	1.0% (0.7,1.3)	-2.4% (-3.7,-1.2)***	<0.001
Fruit products & dishes	2.8% (2.2-3.4)	1.4% (1.1,1.6)	-1.4% (-2.1,-0.8)***	<0.001
Egg products & dishes	2.1% (1.5-2.7)	1.2% (1.1,1.3)	-0.9% (-1.5,-0.3)**	0.003
Fish & seafood products & dishes	2.4% (1.4-3.4)	0.4% (0.3,0.5)	-2.0% (-3.0,-1.0)***	<0.001
Alcoholic beverages	4.5% (2.3-6.7)	-	-	-

Note: Major or sub-major food groups[26] that provide >2% of total energy for either of the methods are shown. Dash (-): not collected by purchase data.
VR-NATSINPAS = very remote sample of National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey; Purchase data = Food and beverage purchase data from 20 very remote Indigenous Australian communities;
**= p<0.05; ** = p<0.01; *** = p<0.001.*
Difference is SSD - VR-NATSINPAS analysed using t-test with unequal variance.

pre-existing food identification code, and that are usually not commercially available. For example, sting-ray would be coded as 'wild-harvested', whereas fin fish that had been wild-caught would not. Therefore, the NATSINPAS data cannot be used to quantify intake of wild-harvested foods. A survey conducted as part of the SHOP@RIC study found that 89% of respondents reported consuming traditional foods at least fortnightly and 71% at least weekly, although quantities were not measured.[32] Traditional foods may still play a role in the Indigenous Australian diet and further research is warranted to estimate the contribution of wild-harvested foods to dietary intake.

A further limitation to using food and beverage purchase data as a surrogate for dietary intake is that it is difficult to estimate the proportion of foods or beverages purchased and not consumed (i.e. food wastage). Some studies using sales data make assumptions about the proportion of food wasted (e.g. 10% wastage applied by Ransley et al.);[33] this also has limitations as it is unlikely that all foods are wasted equally.[34,35] A comprehensive report from the UK reported that 18% of food purchased is wasted, with vegetables, bread and fruit most likely to be wasted.[34,35] While there is no quantitative data on food wastage specific to remote Indigenous Australian communities, the limited available evidence suggests that wastage may be relatively low.[36] Food wastage was rare in the traditional hunter–gatherer lifestyle, even in times of abundance.[36] In 1991, O'Dea et al. suggested that tendency to prevent food wastage was retained, with the general principle being 'if food is there, it is eaten'.[36] Brimblecombe et al. took an ethnographic approach, augmented by interviews, to characterise factors informing food choice in a remote Indigenous community.[37] Participants reported avoiding purchasing highly perishable foods, favouring long-life foods and sharing foods between households, all of which may reduce food wastage.[37] Without quantitative data specific to the remote Indigenous Australian context, assumptions about wastage are unreliable, and subsequently no wastage factor was attributed to the food and beverage purchase data in the present study.

While food and beverage purchase data provide useful and timely information about population food and nutrient exposure, it does not provide information about subgroups within a population (e.g. pregnant women, children etc.). Further, understanding of the context of how, where and why foods and drinks are consumed, as well as understanding the broader food environment, is essential to planning and evaluating food and nutrition policy and programs.[37] Despite these limitations, at the population level, food and beverage purchase data present a method that is (in many cases) relatively inexpensive, timely and non-intrusive.[23] Of the five methods used by Lee et al.[6] to measure dietary intake, the only method rated as acceptable to the community was the store turnover method, which was rated as 'high acceptability'. Further, using objective food and beverage purchase data reduces or eliminates many of the errors inherent in self-reported data, such as under-reporting, response bias and reporting bias.

Limitations of this comparison

Some differences seen in individual food types between the two methods may be due to the way foods are categorised; for example, mixed foods may fall into different categories depending on whether individual ingredients are entered in the NATSINPAS (e.g. entering all ingredients of a sandwich separately or entering a food identification code relating to that type of sandwich). FSANZ has recently released the Australian Dietary Guidelines database,[38] in which the contribution from the five core food groups in the Australian Dietary Guidelines, as well as sub-classifications within food groups, is specified for each of the food identification codes. These data were not available for the NATSINPAS at the time of analysis, therefore we could not include this level of detail in the present comparison; however, this database will help to provide more in-depth information to compare dietary data across datasets and to dietary guidelines in the future.

A further limitation is that the sampling methods differed between the surveys. The ABS aimed to collect a representative sample of Indigenous Australians across Australia while the SHOP@RIC study included only Northern Territory communities, and did not include communities with <100 residents or those with competing stores, which may limit the generalisability of the data to the total population living in remote Indigenous communities. Nevertheless, SHOP@RIC communities were wide-spread across both coastal and inland locations in the Northern Territory, and were representative in relation to age and gender demographics when compared to the entire Australian very remote Indigenous Australian population (Supplementary Table 3).[28] Residents in the 20 SHOP@RIC communities represent 10% of the entire population of Indigenous Australians who reside in very remote parts of Australia (44% of who live in the Northern Territory).[28]

Strengths of the study include that the datasets were collected during the same time period (between 2012–2013), used the same nutrient databases and classification system and provide dietary intake estimates for large samples (1363 in VR-NATSINPAS and ~8,500 individuals using the food and beverage purchase data). Further, as these datasets were not specifically collected for this comparison, comparing the two methods did not burden communities.

Policy implications and future directions in the remote Indigenous setting

Using food and beverage purchase data as an indicator of population diet has enabled researchers and local policy makers to circumvent some of the challenges of collecting dietary data in the remote Indigenous Australian population, while minimising burden on the community. Beyond examining the effectiveness of research interventions, these data can be extremely useful as a monitoring and feedback tool to empower decision makers to improve the health of their communities. For example, in the remote Indigenous Australian setting, store committees often represent the community to make decisions regarding the store. Markers of dietary intake are valuable to store committees in making decisions regarding the food supply (e.g. modifying product availability within the store). We are currently investigating opportunities to develop a longitudinal monitoring system with a larger representative sample of stores (or other food vendors) servicing very remote Indigenous Australian communities to inform the development of local, state-wide and national food and nutrition policy and programs.

There is potential for food and beverage purchase data to complement self-reported data such as that collected by the NATSINPAS,[39] particularly as the measurement errors inherent in purchase data are likely to be independent from those inherent in self-reported data. For example, in future versions of NATSINPAS, it may be considered to use purchasing data to estimate the total sodium and iodine intakes including discretionary salt (which is difficult to quantify in self-reported data), or to use purchases to adjust for energy under-reporting by indicating the foods and beverages where differential reporting is likely to have occurred.

Conclusions

The NATSINPAS provides valuable, much-needed data about the dietary intake of Indigenous Australians; however, there are several limitations to these data. Our findings complement the NATSINPAS data to provide insight into these data gaps. The differences we observed in nutritional estimates derived from the very remote sample of the NATSINPAS and food and beverage purchase data for 20 very remote Indigenous communities are mostly consistent with known self-reporting biases, and suggest that actual dietary intake is less aligned with dietary guidelines than indicated in the NATSINPAS. Using food and beverage purchases to monitor population food and nutrient availability as a surrogate for dietary intake has enabled researchers and local policy makers to circumvent some of the challenges of collecting dietary data in the remote Indigenous Australian setting; however, further evidence is needed to inform approaches to managing limitations such as wastage, contribution of foods and beverages sourced outside the store (including wild-harvested foods) and differences within subgroups of the population.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary Table 1: Estimated nutrient intake/exposure of Indigenous Australians living in very remote parts of Australia using NATSINPAS and food and beverage sales data.

Supplementary Table 2: Proportion of energy from wild-harvested food categories in VR-NATSINPAS.

Supplementary Table 3: Demographic Characteristics for the Very Remote Indigenous Australian Population and the 20 SHOP@RIC Communities.