

PRELIMINARY REPORT

Dental self-care and dietary characteristics of remote-living Indigenous children

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A B S T R A C T

Introduction: Indigenous children in remote communities carry a disproportionate amount of the dental disease burden among Australian 4-12 year-olds. However, there have been no reports of dental service use, dental self-care or dietary characteristics among remote-living Indigenous children. This information may provide insight into behaviours linked with the high levels of dental disease observed. The purpose of this study was to examine such behaviours among Indigenous children in three remote communities in the Top End of the Northern Territory of Australia. The study is part of a wider investigation involving the implementation and monitoring of water fluoridation plants in two of the communities, and the collection of clinical dental data from children in these three and other remote communities.

Methods: In 2003, small-scale fluoridation plants were installed in two remote communities (Communities A and B) in the Top End of the Northern Territory with naturally low fluoride levels in the water and with a high prevalence of child dental disease. Another community (Community C) was selected as a comparison site (natural levels of water fluoride low). A convenience sample of carers of children from all communities completed a questionnaire that sought information on carer education and their children's age, sex, use of dental services, dental self-care behaviours, dietary characteristics, household water source and water consumption. The questionnaires were administered by a project worker and community residents once consent had been obtained. Data were analysed using SPSS version vers.13.0 (SPSS Inc; Chicago, IL, USA).

Results: Some 214 carers completed the questionnaire for 409 children aged 4-12 years; 131 (32.0%) from Community A, 158 (38.6%) from Community B and 120 (29.3%) from Community C. The response rates for the child survey based on Census



data (generally regarded as an undercount) was 55% across the three communities. Approximately one-third of carers had had no secondary schooling or could not recall their level of educational attainment. Child age was reasonably spread over the target age-range and there were no significant differences between communities by sex. Approximately one-third of children were reported to have had their teeth checked every year by a dental therapist and most children were reported to use a toothbrush. While most children were also reported to use toothpaste, only 20% of such children reportedly used it every day. Time of toothpaste use was evenly distributed between morning and evening, with a small proportion of children reportedly using it twice a day. The most common age that toothpaste use began was 4 years and most children had never taken fluoride supplements. Over three-quarters of children who reportedly consumed softdrinks, cordial, milk or flavoured milk in the evenings drank such beverages at least a few evenings each week. Over 90% of children across the three communities who reportedly drank tea, and approximately three-quarters of those who consumed sweet snacks, did so at least a few evenings each week. Almost all houses were connected to the community water supply. Most children sourced their drinking water from a tap and approximately two-thirds were reported to drink more than 4 cups of water a day.

Conclusions: Our study showed there were low levels of preventive dental care, irregular use of dentrifices, negligible implementation of alternative fluoride sources, high consumption of sweetened snacks and drinks in the evenings, and almost universal connection of houses to the public water supply among remote-dwelling Indigenous children. The findings provide some insights into factors contributing to the poor and declining state of such children's dental health, and should aid in the planning and implementation of oral health promotion initiatives.

Key words: children, dental behaviours, diet, Indigenous, remote.

Introduction

Indigenous children in Australia are those who identify as Aboriginal, Torres Strait Islander or both. Such children represent 4.7% of the Australian child population¹. In the Northern Territory – a vast area with a population of approximately 200 000 – approximately 40% of children aged 4-14 years are Indigenous and some 80% of such children live in rural or remote areas¹.

Increasing exposure to non-Indigenous lifestyles has had a marked impact on Indigenous health, particularly Indigenous child health. Indigenous children are more likely to be hospitalised than other Australian children, and are at higher risk of disease and injury². They experience greater disability and reduced quality of life due to ill health, partake in higher levels of health risk behaviours (eg petrol sniffing) and are more exposed to violence in the home. In 2002, Indigenous child mortality rates were 2.7 times those of non-Indigenous

children². Indigenous children are also more than twice as likely to have been born underweight than other Australian children², with low birth weight babies being more prone to ill health, including dental ill-health, in later life^{3,4}.

Among the more profound Indigenous lifestyle modifications to have impacted on health is change in diet⁵. The food intake of Indigenous Australian children has undergone rapid modification in the last decade, with a diet that was rich in fiber, protein and low saturated fat being replaced by one in which refined carbohydrates and saturated fats predominate⁶. Such dietary changes, together with an increasingly sedentary life-style, have had a grave impact on the general health of remote Indigenous children, with the prevalence of obesity and type II diabetes among such children escalating in recent years⁷.

Up until the 1980s, Indigenous Australian children were recognised as having better oral health than their non-Indigenous counterparts⁸⁻¹¹. Recent evidence suggests,



however, that Indigenous children now have, on average, twice as much (and in some communities, up to five times as much) tooth decay as their non-Indigenous counterparts^{12,13}. In one study of remote Indigenous children, less than 10 percent of tooth surfaces with experience of decay had been treated with a filling, and more than 90% of child dmfs (the sum of decayed, missing and filled deciduous tooth surfaces) was made up of either decayed or missing surfaces¹⁴.

This study is part of a wider investigation examining the feasibility and impact of introducing water fluoridation plants into remote communities in the Northern Territory's Top End. The purpose of this report is to describe the self-reported use of dental services, dental health behaviours and dietary characteristics relevant to fluoride intake of Indigenous children in these communities. The article provides some insights into dental behavioural characteristics of children in a remote Australian Indigenous context, and should be useful in the design and application of oral health promotion initiatives in this and similar settings.

Methods

In 2003, small-scale fluoridation plants were installed in two remote communities in the 'Top End' of the Northern Territory with naturally low fluoride levels in the water and with a high prevalence of child dental disease. Another community was selected as a comparison site (natural levels of water fluoride low). The study population for purposes of our investigation comprised all children aged between 4 and 12 years (inclusive) in the three communities hereafter referred to as Community A, B or C (Figure 1). Uncertainty of population estimates and high mobility of residents between communities and houses within communities^{15,16} precluded a random sampling approach. We therefore aimed to interview as many carers of children in the target age range as possible. For each child, data on carers' highest level of educational attainment and the child's age, sex, use of dental services, dental care behaviours, diet and household

water source was obtained. The questionnaires were administered by a project officer assisted by a local community member in carers' homes or other locations in and around the community, depending on where carers could be located and their preference for location and time of interview. The dietary questions were based on those by Levine¹⁷ who found that children who consumed cariogenic food and beverage products in the evening had markedly more dental caries than their counterparts who did not. Ethical approval was obtained from the formally constituted ethics committee and the Indigenous sub-committee for this region. Informed consent was obtained from the carers.

Data were analysed using SPSS vers 13.0 (SPSS Inc; Chicago, IL, USA) and levels of statistical significance were set at $p < 0.05$. The χ^2 test was used to measure statistically significant differences between proportions.

Results

In total, 214 carers completed questionnaires for 409 children; 131 (32.0%) from Community A, 158 (38.6%) from Community B and 120 (29.3%) from Community C. The response rate of the child survey based on Census data (generally regarded as an undercount) was 55% across the three communities, ranging from 47% in Community B to 72% in Community A. Response rates based on other population estimates were somewhat lower (Table 1).

Approximately one-third of carers had had no secondary schooling (36%) and one-fifth (21%) could not recall their highest level of educational attainment (Table 2).

The ages of children for whom data were obtained were reasonably evenly spread across the target age range, with slightly smaller numbers in the higher and lower ages. There were no significant differences between communities by sex (Table 3).

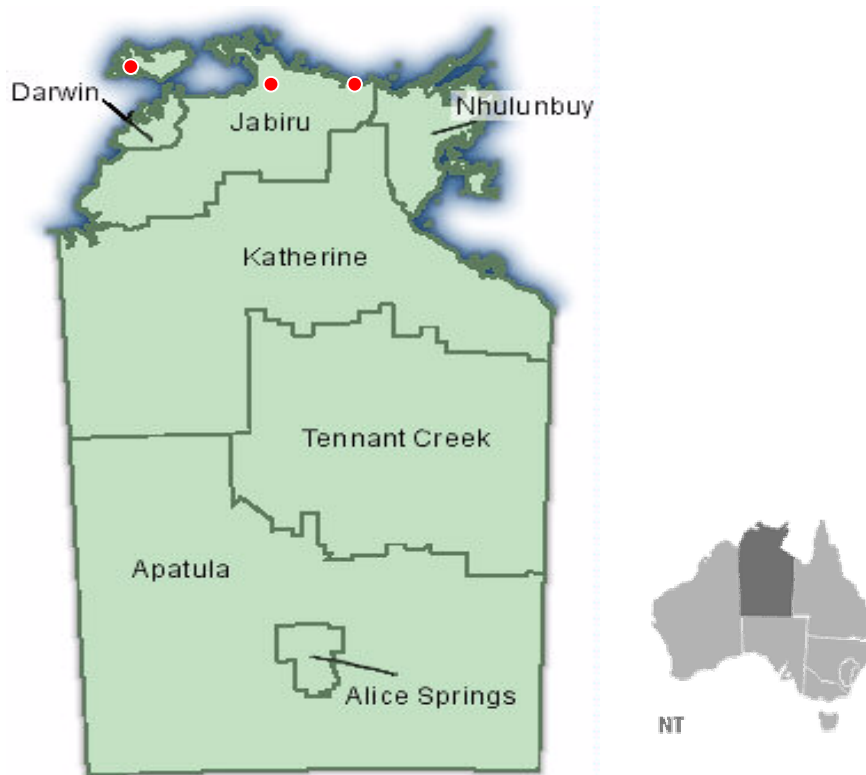


Figure 1: Location of the three study communities in relation to Darwin, Northern Territory (communities highlighted in red).

Table 1. Coverage area of interview data

Variable	Community A	Community B	Community C	Total
Population 4–12 years (Census)	183	333	223	739
Population 4–12 years (high estimate)	280	470	230	980
Carers interviewed	63	91	60	214
Children for whom interview data obtained	131	158	120	409
Percent response rate for child survey data (Census)	71.6	47.4	53.8	55.3
Percent response rate for child survey data (high estimate)	46.8	33.6	52.2	41.7



Table 2. Education characteristics of carers by location

Variable	Community A <i>n</i> (%)	Community B <i>n</i> (%)	Community C <i>n</i> (%)	Total <i>n</i> (%)
Highest educational attainment*				
Primary school	8 (12.7)	19 (21.1)	6 (10.0)	33 (15.5)
Year 8	11 (17.5)	16 (17.8)	2 (3.3)	29 (13.6)
Year 9	7 (11.1)	4 (4.4)	3 (5.0)	14 (6.6)
Year 10	17 (27.0)	17 (18.9)	15 (25.0)	49 (23.0)
Year 11	4 (6.3)	9 (10.0)	13 (21.7)	26 (12.2)
Year 12	2 (3.2)	2 (2.2)	6 (10.0)	10 (4.7)
University or college	0	5 (5.6)	3 (5.0)	8 (3.8)
Don't know/can't remember	14 (22.2)	18 (20.0)	12 (20.0)	44 (20.7)
Total	63 (100.0)	91 (100.0)	60 (100.0)	214 (100.0)

*Chi-square test: $p < 0.05$

Table 3. Demographic characteristics of children by location

Variable	Community A <i>n</i> (%)	Community B <i>n</i> (%)	Community C <i>n</i> (%)	Total <i>n</i> (%)
Age				
4 years	10 (7.6)	12 (7.6)	8 (6.7)	30 (7.3)
5 years	16 (12.2)	15 (9.5)	11 (9.2)	42 (10.3)
6 years	16 (12.2)	13 (8.2)	17 (14.2)	46 (11.2)
7 years	17 (13.0)	17 (10.8)	13 (10.8)	47 (11.5)
8 years	16 (12.2)	22 (13.9)	21 (17.5)	59 (14.4)
9 years	15 (11.5)	19 (12.0)	16 (13.3)	50 (12.2)
10 years	11 (8.4)	18 (11.4)	10 (8.3)	39 (9.5)
11 years	10 (7.6)	14 (8.9)	11 (9.2)	35 (8.6)
12 years	10 (7.6)	15 (9.5)	2 (1.7)	27 (6.6)
Missing	10 (7.6)	13 (8.2)	11 (9.2)	34 (8.3)
Total	131 (100.0)	158 (100.0)	120 (100.0)	409 (100.0)
Sex				
Male	67 (51.1)	74 (46.8)	57 (47.5)	198 (48.4)
Female	64 (48.9)	84 (53.2)	63 (52.5)	211 (51.6)

Approximately one-third (37%) of children were reported to have had their teeth checked every year by a dental therapist, although this varied significantly between communities (range 28% to 44%; Table 4). Most children (84%) were reported to use a toothbrush, but again there were significant community variations (Table 4). While 89% of children were reported to use toothpaste (with a similar significant variation between communities), only 20% of these children were reported to use it every day (Table 4). Time of

toothpaste use was reasonably evenly distributed between morning (67%) and evening (61%), with some children reportedly using it twice a day, and a small proportion reporting use at lunchtime (23%). Across all communities, the most common age that toothpaste application began was 4 years (49%) and less than 2% of children had ever taken fluoride tablets or drops.



Table 4. Self-reported use of dental services and dental behaviour characteristics of children by location

Variable	Community A n (%)	Community B n (%)	Community C n (%)	Total n (%)
Teeth checked by dental therapist?*				
Yes, every year	48 (36.6)	69 (43.7)	33 (27.5)	150 (36.7)
Yes, sometimes	37 (28.2)	39 (24.7)	26 (21.7)	102 (24.9)
No	34 (26.0)	37 (23.4)	48 (40.0)	119 (29.1)
Don't know	12 (9.2)	13 (8.2)	13 (10.8)	38 (9.3)
Use toothbrush?***				
Yes	115 (87.8)	142 (89.9)	86 (71.7)	343 (83.9)
No	16 (12.2)	16 (10.1)	34 (28.3)	66 (16.1)
Use toothpaste?***				
Yes	120 (91.6)	148 (93.7)	97 (80.8)	365 (89.2)
No	11 (8.4)	10 (6.3)	23 (19.2)	44 (10.8)
Frequency of using toothpaste**				
Every day	16 (13.3)	43 (28.7)	16 (16.0)	75 (20.3)
Sometimes	97 (80.8)	101 (67.3)	77 (77.0)	275 (74.3)
Hardly ever	7 (5.8)	5 (3.3)	2 (2.0)	14 (3.8)
Don't know	0	1 (0.7)	5 (5.0)	6 (1.6)
Time of day that use toothpaste** (multiple response)				
Morning	59 (49.2)	112 (75.2)	76 (76.0)	247 (66.9)
Lunchtime	11 (9.2)	54 (36.2)	18 (18.0)	83 (22.5)
Evening	46 (38.3)	119 (80.4)	60 (60.0)	225 (61.1)
Age when started using toothpaste**				
1 year	6 (5.0)	1 (0.7)	14 (14.0)	21 (5.7)
2 years	4 (3.3)	11 (7.4)	9 (9.0)	24 (6.5)
3 years	15 (12.5)	34 (22.8)	24 (24.0)	73 (19.8)
4 years	87 (72.5)	62 (41.6)	30 (30.0)	179 (48.5)
5 years	2 (1.7)	11 (7.4)	7 (7.0)	20 (5.4)
6 years	3 (2.5)	11 (7.4)	2 (2.0)	16 (4.3)
7 years	0	1 (0.7)	2 (2.0)	3 (0.8)
8 years	1 (0.8)	1 (0.7)	1 (1.0)	3 (0.8)
9 years	0	3 (2.0)	1 (1.0)	4 (1.1)
Don't know	2 (1.7)	14 (9.4)	10 (10.0)	26 (7.0)
Ever taken fluoride drops or tablets?				
Yes	0	2 (1.3)	1 (0.8)	3 (0.7)
No	131 (100.0)	154 (97.4)	115 (95.9)	400 (97.8)
Don't know	0	2 (1.3)	4 (3.3)	6 (1.5)
Total	131 (100.0)	158 (100.0)	120 (100.0)	409 (100.0)

*Chi-square test: $p < 0.05$; **Chi-square test: $p < 0.001$; ***Chi-square test: $p < 0.005$

Over three-quarters of children who reportedly consumed softdrinks, cordial, milk or flavoured milk in the evenings drank such beverages at least a few evenings each week (Table 5). Over 90% of children across the three

communities who reportedly drank tea, and about three-quarters of those who consumed sweet snacks, did so at least a few evenings each week (Table 5).



Table 5. Self-reported dietary characteristics of children by location

Variable	Community A n (%)	Community B n (%)	Community C n (%)	Total n (%)
Drink soft drinks in the evenings* (total)	76 (100.0)	94 (100.0)	96 (100.0)	266 (100.0)
Every evening	15 (19.7)	29 (30.9)	22 (22.9)	66 (24.8)
A few times a week	33 (43.4)	44 (46.8)	60 (62.5)	137 (51.5)
About once a week	23 (30.3)	10 (10.6)	7 (7.3)	40 (15.0)
Less than once a week	2 (2.6)	9 (9.6)	4 (4.2)	15 (5.6)
Don't know	3 (3.9)	2 (2.1)	3 (3.1)	8 (3.0)
Drink fruit juice in the evenings** (total)	95 (100.0)	95 (100.0)	76 (100.0)	266 (100.0)
Every evening	26 (27.4)	25 (26.3)	9 (11.8)	60 (22.6)
A few times a week	35 (36.8)	45 (47.4)	52 (68.4)	132 (49.6)
About once a week	27 (28.4)	18 (18.9)	11 (14.5)	56 (21.1)
Less than once a week	2 (2.1)	4 (4.2)	0	6 (2.3)
Don't know	5 (5.3)	3 (3.2)	4 (5.3)	12 (4.5)
Drink cordial in the evenings (total)	98 (100.0)	120 (100.0)	110 (100.0)	328 (100.0)
Every evening	22 (22.4)	32 (26.7)	31 (28.2)	85 (25.9)
A few times a week	54 (55.1)	53 (44.2)	61 (55.5)	168 (51.2)
About once a week	19 (19.4)	29 (24.2)	12 (10.9)	60 (18.3)
Less than once a week	2 (2.0)	3 (2.5)	3 (2.7)	8 (2.4)
Don't know	1 (1.0)	3 (2.5)	3 (2.7)	7 (2.1)
Drink milk or flavoured milk in the evenings (total)	91 (100.0)	101 (100.0)	77 (100.0)	269 (100.0)
Every evening	29 (31.9)	30 (29.7)	22 (28.6)	81 (30.1)
A few times a week	41 (45.1)	46 (45.5)	44 (57.1)	131 (48.7)
About once a week	19 (20.9)	18 (17.8)	8 (10.4)	45 (16.7)
Less than once a week	1 (1.1)	5 (5.0)	0	6 (2.2)
Don't know	1 (1.1)	2 (2.0)	3 (3.9)	6 (2.2)
Drink tea in the evenings*** (total)	112 (100.0)	136 (100.0)	106 (100.0)	354 (100.0)
Every evening	53 (47.3)	90 (66.2)	67 (63.2)	210 (59.3)
A few times a week	44 (39.3)	35 (25.7)	34 (31.1)	112 (31.6)
About once a week	11 (9.8)	9 (6.6)	2 (1.9)	22 (6.2)
Less than once a week	3 (2.7)	0	0	3 (0.8)
Don't know	1 (0.9)	2 (1.5)	4 (3.8)	7 (2.0)
Eat fruit in the evenings (total)	109 (100.0)	124 (100.0)	103 (100.0)	336 (100.0)
Every evening	36 (33.0)	49 (39.5)	30 (29.1)	115 (34.2)
A few times a week	40 (36.7)	37 (29.8)	50 (48.5)	127 (37.8)
About once a week	28 (25.7)	31 (25.0)	18 (17.5)	77 (22.9)
Less than once a week	4 (3.7)	5 (4.0)	2 (1.9)	11 (3.3)
Don't know	1 (0.9)	2 (1.6)	3 (2.9)	6 (1.8)



Table 5. Self-reported dietary characteristics of children by location (cont'd)

Eat sweet snacks in the evenings* (total)	100 (100.0)	119 (100.0)	104 (100.0)	323 (100.0)
Every evening	43 (43.0)	26 (21.8)	37 (35.6)	106 (32.8)
A few times a week	32 (32.0)	47 (39.5)	54 (51.9)	133 (41.2)
About once a week	10 (10.0)	35 (29.4)	5 (4.8)	50 (15.5)
Less than once a week	13 (13.0)	10 (8.4)	4 (3.8)	27 (8.4)
Don't know	2 (2.0)	1 (0.8)	4 (3.8)	7 (2.2)
Total	131 (100.0)	158 (100.0)	120 (100.0)	409 (100.0)

*Chi square test: $p < 0.001$; **Chi square test: $p < 0.01$; ***Chi-square test: $p < 0.005$

Table 6. Household water source and self-reported water consumption of children by location

Variable	Community A <i>n</i> (%)	Community B <i>n</i> (%)	Community C <i>n</i> (%)	Total <i>n</i> (%)
Source of dwelling's water supply				
Town water (mains)	61 (96.8)	88 (96.7)	58 (96.7)	207 (96.7)
Bore (not connected to mains)	2 (3.2)	3 (3.3)	2 (3.3)	7 (3.3)
Drink water from tap	130 (99.2)	156 (98.7)	120 (100.0)	406 (99.3)
Amount of water consumed each day*				
More than 8 cups	49 (37.4)	63 (39.9)	55 (45.8)	167 (40.8)
4-8 cups	39 (29.8)	39 (24.7)	16 (13.3)	94 (23.0)
2-4 cups	21 (16.0)	45 (28.5)	28 (23.3)	94 (23.0)
Less than 2 cups	12 (9.2)	5 (3.2)	14 (11.7)	31 (7.6)
Don't know	10 (7.6)	6 (3.8)	7 (5.8)	23 (5.6)
Total	131 (100.0)	158 (100.0)	120 (100.0)	409 (100.0)

*Chi-square test: $p < 0.005$

Almost all (97%) carers reported that their house was connected to the community water supply (Table 6) and most (99%) children sourced their drinking water from a tap (household or otherwise; Table 6). Approximately two-thirds (64%) of children were reported to drink more than 4 cups of water a day

- negligible implementation of alternate fluoride sources (drops or tablets)
- high consumption of sweetened drinks and snacks in the evenings
- almost universal connection of houses to the public water supply.

Discussion

This cross-sectional investigation of remote-dwelling Indigenous children has shown:

- low levels of regular dental preventive care
- irregular application of toothpaste use
- late onset of toothpaste utilisation

The study provides some insights into factors that may contribute to the poor and declining state of dental health in Indigenous children.

The prevalence of child use of dental services reported by carers was lower than reported figures for the general Northern Territory child population¹⁸. This is despite the Northern Territory School Dental Service (SDS) visiting each community in the study several times annually. The



under-utilisation of such services may be due to a number of reasons including:

- limited awareness of preventive dental measures
- inability to obtain consent from carers for child dental check-ups and follow-up care
- high mobility of children
- low school attendance limiting opportunities for SDS therapists to deliver services
- short duration of SDS visits

Limited dental service utilisation has also been reported among remote-dwelling Indigenous children in New Zealand¹⁹ and Alaska²⁰.

Low levels of carer education, together with high toothpaste costs and difficulties in establishing tooth-brushing routines due to a number of different households being stayed in a given week²¹, may contribute to the low prevalence of toothpaste use in our study compared with that reported in the general Australian child population²². The most frequently reported age that toothpaste was first used was 4 years, which perhaps reflects pre-school commencement and consequent initiation of institution-organised oral hygiene strategies. However, only 20% of children were reported to use toothpaste every day. It is recommended that brushing of teeth begin soon after the emergence of primary teeth (around 6 months of age), low-concentration fluoride toothpaste use to commence at the age of 18 months and for teeth to be brushed twice a day (with the child needing assistance up until at least the age of five years)²³. Late onset of tooth brushing with a fluoride toothpaste is a predictor of poor child oral health outcomes²⁴.

Children in our study had a higher reported frequency of cariogenic food and beverage consumption than their average Australian counterparts⁷, which may have been due to:

- lack of healthy food available in communities²
- lack of culturally appropriate information on healthy food available in communities or
- lack of nutritional knowledge by carers.

People in remote communities have limited access to fresh food produce, although there is generally no shortage of cariogenic food and beverage items⁵. The motivation to purchase fresh food produce is often marred by cost, with vegetables and fruit frequently being more expensive than less nutritious food options⁶. Our findings are supported by Gracey, who reported that consumption of carbonated beverages and confectionary among remote-living Indigenous children had almost become the cultural norm⁷.

The Top End of the Northern Territory experiences a tropical climate with an annual temperature range of 19-35°C²⁵. That most children were reported to drink over 4 cups of water each day, and to drink tea every evening, was consequently unsurprising and bodes well with the introduction of water fluoridation plants as a means of reducing child caries levels.

Limitations of this study

Obtaining reliable self-report information from remote-dwelling Indigenous populations is acknowledged as being difficult²⁶ and our study was no exception. The generalisability and precision of the findings are limited by the response rates and the non-random sampling process. Biases may also have been introduced by community residents introducing the data-collector to carers who were generally more educated, of higher socio-economic status and who spoke English with more ease. Locating families in the poorer parts of each community was frequently not possible due to the reluctance of community assistants to go there. Furthermore, the dietary and water consumption questions were difficult to administer and carers frequently struggled with quantities, frequencies and the usual patterns of their children (who often ate at relatives homes). A degree of caution should therefore be exercised when interpreting the investigation's findings.

Conclusion

Our study is noteworthy for being a rare example of the use of face-to-face interview techniques to obtain remote-



dwelling Indigenous child dental self-care and dietary information. The findings provide a useful basis for further investigations to enhance promotion of dental health and delivery of dental services in these and other remote community settings.

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