

Estimation of daily dietary fluoride intake: 3-day food diary vs 2-day duplicate plate

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Abstract

Three-day food diary (3-d FD) or 2-day duplicate plate (2-d DP) methods have been used to measure dietary fluoride (F) intake by many studies. This study aimed to compare daily dietary F intake (DDFI) estimated by the 3-d FD and 2-d DP methods at a group and individual level.

Dietary data for 61 healthy children aged 4-6 years were collected using 3-d FD and 2-d DP methods with a one-week gap between each collection. Food diary data were analysed for F using the Weighed Intake Software Package (WISP) while duplicate diets were analysed by an acid-diffusion method using a F-Ion Selective Electrode (F-ISE). Paired t-test and linear regression were used to compare dietary data at the group and individual level respectively. At the group level mean (SD) DDFI was 0.025 (0.016) and 0.028 (0.013) mg/kgbw/d estimated by 3-d FD and 2-d DP respectively. No statistically significant difference ($P=0.10$) was observed in estimated DDFI by each method at the group level. At an individual level the agreement in estimating F intake (mg/kgbw/d) using the 3-d FD method compared with the 2-d DP method was within ± 0.011 (95% CI 0.009-0.013) mg/kgbw/d.

At group level DDFI data obtained by either 2-d DP or 3-d FD methods can be replaced. At an individual level the typical error and narrow margin between optimal and excessive F intake suggested that the DDFI data obtained by one method cannot replace those dietary data estimated from the other method.

Introduction

Fluoride (F) has an important nutritional and public health impact due to its beneficial role in mineralisation of bones and teeth ⁽¹⁾. Following gastrointestinal absorption, F is mainly incorporated into calcified tissues which contain more than 99% of body burden of F. The role of F in improving oral health by providing a protective effect against dental caries is well established ^(2,3). However, excessive F intake during tooth development can increase the risk of dental fluorosis (tooth mottling). The optimal total daily intake of F to benefit dental health while minimising the risk of developing dental fluorosis, has been suggested to range between 0.05-0.07 mg/kgbw/d ⁽⁴⁾ while an intake of 0.1 mg/kg bw/d has been termed as the Tolerable Upper Intake Level (UL) ⁽⁵⁾; the level at which moderate forms of dental fluorosis can develop. Due to the narrow margin between optimal and excessive F intake, knowledge of total daily F intake (TDFI) at individual and population level is essential when recommendations for F use, particularly in young children, are being considered.

The common sources of systemic F are diet and toothpaste. According to the literature, the reported contribution of diet to TDFI ranges from 20% in 1-3 year old Brazilian children ⁽⁶⁾ to 75% in 6 year olds living in an optimally fluoridated area in the US⁽⁷⁾. Such variation could be due to the differences in age, tooth-brushing, dietary habits and F concentration of the diet as well as the dietary methods used to assess dietary F intake in these groups of children.

In a group of 6-7 year old UK children, diet has been reported as contributing between 44% and 41% of TDFI of those living in a low F area (0.30 mgF/l) and natural F area (1.06 mgF/l), respectively ⁽⁸⁾. Tap water, fruit squashes (prepared with tap water), as well as cooked rice, pasta and vegetables were reported as the main sources of dietary F intake in 6-7 year olds receiving optimally F water (0.82 mgF/l), whereas carbonated soft drinks and bread were the most important contributors to dietary F intake in those children receiving non-fluoridated water (0.08 mgF/l) ⁽⁹⁾.

Depending on the purpose of the evaluation, different methods have been used to assess dietary intake of energy and nutrients, with a 7-day weighed food diary regarded frequently as the “gold standard” method ⁽¹⁰⁾. However, the two most commonly used dietary assessment methods for daily dietary F intake (DDFI) are duplicate plate and food diary methods. While the food diary method estimates F intake on the basis of food composition tables, the actual foods and drinks collected in duplicate diets are analysed for F when a duplicate plate method is used. However, both methods have drawbacks which may limit their use in some populations. Due to F analysis of the duplicated diets, this method is

suggested to reflect the actual F content of the diet ⁽¹¹⁾. However, this estimate might be affected by reporting bias if any food or drink items are omitted from the duplicate. In addition, since all the food and drinks are pooled, the primary food or drink sources of dietary F intake cannot be identified. In contrast, with the food diary method a full description is provided for consumed food and drinks, allowing individual sources of F intake to be identified ⁽¹²⁾. Furthermore, if food and drinks are recorded at the time of consumption, the measurement is less likely to be affected by misreporting. The food diary method is also less burdensome for participants and therefore more practical for use with large numbers of study subjects. However, the food diary method may also be affected by coding errors and/or non-inclusion of a given food type in the food composition table ⁽¹³⁾. The major burden of the duplicate plate collection is the cost, which may result in individuals altering their dietary habits. Although the cost of duplicating is usually reimbursed to participants, applying this method to large scale epidemiological studies can be very costly and might result in a lower response rate ^(10,14).

Regular monitoring of F intake in children has been suggested by the World Health Organisation ^(15,16). To maximise prevention of dental caries while minimise risk of dental fluorosis, assessment of F intake at both an individual and community level is crucial prior to making any decision on F use or F supplementation.

No robust evidence is available to suggest use of one method over another for assessment of dietary F intake, although the choice is dependent on the aims and objectives of a given study; e.g. to identify the main dietary sources of fluoride or to provide baseline data for public health administrators when determining whether any additional fluoridisation programme for caries prevention is needed

There is only one pilot study in the literature which has reported dietary F intake estimated by both duplicate plate and food diary methods in a group of 15-30 month old children living in an area with fluoridated water supply in Indiana, US ⁽¹⁷⁾. However, the major limitation of that study was the small sample size (n 12) all of whom were recruited from a single day care centre. Furthermore, findings from one population and in a particular setting can be limited in terms of representativeness and potential for extrapolation and therefore additional research in different populations and settings is warranted. Therefore, the aim of this present study was to compare daily dietary F intake (DDFI), at group and individual levels, estimated by “2-day duplicate plate (2-d DP)” and “3-day food diary (3-d FD)”. The subsidiary aims were to compare daily variation in dietary F intake at individual level obtained by each method.

Materials and Methods

This study was conducted according to the guidelines in the Declaration of Helsinki. All procedures involving human subjects were approved by the County Durham and Tees Valley I Research Ethics Committee (Ethics no. 08/H0905/116). Written informed consent was obtained from all participants prior to the study.

The study was undertaken in Newcastle upon Tyne; a city located in the north-east of England with the tap water supply fluoridated at 0.9 ppm. Prior to the study, the Director of Children's Service Directorate and Local Education Authorities were contacted and informed of the study. Parents of all healthy children aged 4-6 years were contacted through the primary schools which agreed to take part in the study. In total, 61 parental consents were obtained.

The study had a randomised cross-over design, comparing observations within and between individuals. Each child underwent two data and sample collection sessions in which a different dietary method was used, with an interval of approximately one week between each session. Children were randomised to the order in which the two allocated dietary methods were used and each family was visited three times at home between April and November 2009 to collect samples and data.

In Visit 1, the weight of child was measured without shoes and jacket to the nearest 0.1 kg using a portable digital balance (SOHENLE Linea; ADE GmbH & Co, Germany). Height was also measured to the nearest 0.1 cm using a stadiometer (SOHENLE MZ10020; ADE GmbH & Co, Germany). Parents were provided with collection containers and bottles as well as written instructions for collecting duplicated meals and verbal instructions for samples collection. A sample of tap water was collected at each visit and dietary data collected in the 2nd and 3rd visits. The importance of maintaining the usual dietary habits during dietary data collection was emphasised to the parents.

Dietary data collection

3d-FD method

A food diary, with a full instruction on how to record food/drink items, was given to parents. They were also instructed verbally on how to estimate serving portion sizes using common everyday household items^(9,12,18). They were asked to take the food diary with them anywhere they went outside the home and record all food and drinks consumed by their child over three consecutive days, comprising two weekdays and one weekend day. During weekdays if the child took a packed lunch to school, food and drinks included in the packed lunch were recorded by the parents. Parents were asked to remind their child to bring back

any left-overs in order for them to record the correct amount of consumed food. However, if the child was receiving a school dinner, the study researcher attended the school to record the items. In addition, for each home-made food and drink consumed, parents were requested to keep a sample of approximately 50g in a plastic storage container provided for this purpose and record the recipe in the food diary. During weekdays the study researcher attended at the school to record the items consumed by each study child. A post-completion interview with parents was conducted on Day 4 (Visit 2) to ensure that all dietary data had been recorded as precisely as possible. The accuracy of estimates of food portion sizes made by parents was also checked using a photographic food atlas ⁽¹⁹⁾.

2- DP method

Parents were asked to duplicate portions of all food and drink items consumed by their child by carefully observing and replicating the actual consumed amounts over two consecutive days; one weekday and one weekend day ^(11,20). Parents were provided with; 1) storage containers for duplicated food, 2) storage bottles for duplicated water and 3) storage bottles for other duplicated drinks and were instructed to separate parts of food items not normally eaten such as bones, fruit skin, cores etc., before placing them in the provided container, keeping containers for each day separate. During the school days, an identical duplicate of each child's school dinner as well as any other consumed items such as mid-day snack was obtained from the school by the researcher.

At the post-completion interview which was conducted on Day 3 (Visit 3), all duplicate items were checked with parents to ensure that no food and drinks had been omitted from the duplicated collection.

Sample preparation and F analysis

2d-DP: Duplicate food samples collected daily at home and school were pooled, weighed and homogenised using an industrial blender (Thermomix, TM31; Vorwerk, Germany).

3d-FD: Collected home-made food samples were also homogenised using a small domestic food processor (Kenwood, CH180A, UK).

The F concentrations of water and non-milk based drinks were measured by a direct method and in triplicate using a F ion-selective electrode (F-ISE) (Model 9409; Orion, USA) and meter (Model 720, Orion, USA) after sample buffering with total ionic strength adjustment buffer (TISAB III) ⁽²¹⁾. Food samples and milk-based drinks were analysed in triplicate for F concentration after overnight hexamethyldisiloxane-facilitated diffusion at room temperature using a F-ISE and meter ^(21,22). Reliability of the F measurements was checked by re-analysis

of 10% of all food and drink samples and a known amount of F was added to 10% of all samples to evaluate the validity of the F analysis method.

Assessment of DDFI:

3d-FD: the dietary records for each child were analysed using Weighed Intake analysis Software Package (WISP) developed by Tinuviel, UK ⁽²³⁾. WISP is a nutritional analysis programme based on nutrient files compiled from McCance & Widdowson's food composition tables (5th and 6th Editions and their supplements) ⁽²⁴⁾. However, WISP, like any other nutrient software, does not include information on F content of food and drinks. An in-house F database developed by both Newcastle and Teesside Universities ⁽²⁵⁾ was used, from which information on the F content of several hundred food and drink items were added to WISP.

2d-DP: Measured F concentrations of foods ($\mu\text{g/g}$), drinks and water ($\mu\text{g/ml}$) representing the average of triplicate readings were multiplied by the weight of the corresponding items consumed by each child per day to estimate DDFI from each source.

Statistical analysis

Data were descriptively analysed using SPSS version 17.0 (SPSS, Chicago, IL, USA) and a paired t-test used to compare the two dietary methods at the group level.

Dietary data at the individual level were compared using linear regression analysis.

The typical within-child variability (expressed as a standard deviation) in dietary F intake from one measurement to the other was derived from the root of the mean square error for the within-subject effect.

Results

Anthropometric data

All 61 children completed all aspects of the study. The mean (SD) age, weight, height and BMI were 5.5 (0.9) years, 21.2 (4.1) kg, 113.1 (7.3) cm and 16.4 (1.9) kg/m^2 respectively.

Quality control of F analysis

The mean difference in F concentration from test to re-test ranged from 0.003 $\mu\text{g/g}$ for food to 0.018 $\mu\text{g/ml}$ for water samples. The mean (SD) % recovery of F added to the samples prior to F analysis was 99.3 (0.53) %.

Comparison of the weight of consumed food, drinks, and water recorded using the 2 methods

The mean weights of food, drinks, and water obtained by each method are presented in Table 1. There was no statistically significant difference in the mean weight of consumed drinks (excluding water) between the two methods. However, the mean weight of collected water recorded by 2d-DP (204g) was significantly higher ($P<0.001$) than the corresponding weight recorded by the 3d-FD method (139g). For solid foods, the mean weight reported by 3d-FD (839g) was significantly higher ($P<0.001$) than that obtained by the 2d-DP method (734g). Overall, no statistically significant difference ($P=0.88$) was observed in the total weight of all food and drinks consumed by the children between the 3-d FD (1271g) and 2-d DP (1266g) methods.

Comparison of DDFI from food drinks and water using the 2 methods at the group level

The DDFI from three major dietary sources; food, drinks and water, recorded by each method are presented in Table 2. The mean DDFI from drinks (excluding water) and from foods (mg/d and mg/kgbw/d) was not statistically significantly different between the two methods when analysed using a paired t-test. However, a statistically significantly higher DDFI from water ($P<0.001$) was obtained when the 2d-DP method was used. The mean (SD) DDFI from all dietary sources (in mg/d and mg/kgbw/d) estimated by 3-d FD method was 0.533 (0.319) mg/d (0.025 (0.016) mg/kgbw/d) while the corresponding values estimated by 2-d DP method were not statistically significantly different at 0.583 (0.263) mg/d (0.028 (0.013) mg/kgbw/d).

Comparison of DDFI using the two methods at the individual level:

Based on the linear regression analysis, at the individual level the typical error (95% CI) in estimating F intake using the 3-d FD method compared with 2-d DP method was within ± 0.011 (95% CI 0.009, 0.013) mg/kgbw/d. Table 3 describes the higher within-child variation of ± 0.280 (95% CI 0.240, 0.340) mg/d in DDFI when dietary data were collected by the 3-d FD method compared with the 2-d DP method, for which the within-child variation was ± 0.191 (95% CI 0.160, 0.230) mg/d.

Comparison of the percentage of children with suggested optimal and UL for F intake using the two methods at the individual level:

When dietary data were collected by the 3-d FD method, the DDFI of only 3.3% children was within the suggested optimal range of F intake (i.e. 0.05-0.07 mg/kg bw/d), while for 1.6% of children the DDFI was higher than the threshold of the UL for F intake (i.e. 0.1 mg/kg bw/d). However, when DDFI was estimated by the 2-d DP method, 9.8% of children received optimal F intake and no child exceeded the UL F intake (Figure 1).

Discussion

This study compared DDFI recorded by 3-d FD and 2-d DP methods at the group and individual levels and for the first time from the 3 major dietary groups; food, water and drinks. The selection of the number of data collection days in this study was mainly based on other F intake studies which used two days and three days for duplicate and food diary methods respectively ^(11,12,26). The present study showed no statistically significant differences in the estimated mean total weight of food and drinks consumed per day between the two methods (Table 1). Although the mean weight (g) of food consumed per day was lower when dietary data were collected by the 2-d DP method, this difference was not statistically significant. A possible explanation for the difference seen is the high level of co-operation required from participants when a 2-d DP method is used since participants need to keep food containers with them for duplication of food and drinks consumed and/or purchase a similar portion of the food when they eat out. This is an extra cost and might result in participants altering their dietary habits, and therefore presents a problem with this method since such changes in dietary habits are not desirable in studies investigating customary nutrient intakes. The parents in the present study commented that they tended to change their customary dietary habits slightly (e.g. decided not to eat out) when duplicating meals (i.e. using the 2-d DP method).

The 3-d FD method potentially offers several advantages, compared with the 2-d DP method, since it is cheaper with fewer burdens on participants. Food diaries are pocket-sized and can be carried easily, allowing food and drink recording to be made at the time of consumption, reducing the risk of omissions. The post-collection interview used with this method also enhances the accuracy of the methods by clarifying areas of potential misunderstanding by respondents as well as identifying omitted food and drinks. Furthermore, food and drink quantification is improved by the use of models of food and drink servings. Since details of consumed food and drinks including brand name, cooking and preparation methods and ingredients of mixed dishes are recorded, the sources of F intake can also be identified more thoroughly and accurately ⁽¹²⁾. It is not a common practice to collect food/drink items for analysis when assessing intakes of most nutrients using a food diary since the Food composition tables provide information on nutrient content of foods and drinks. However, in view of the impact of F concentration of the water used for preparation on the F content of a prepared meal, as well as the lack of F information in food composition tables and reliance on an in-house fluoride database ⁽²⁵⁾ for commonly consumed foods and drinks which requires

regular updating, collection of home-made as well as school-made meals increases the precision of the food diary method when assessing dietary F intake.

In the present study both methods provided similar results for mean total DDFI at the group level. The majority of F intake studies have used a duplicate method to collect dietary data. The estimate for DDFI (mg/kgbw/d) in the present study when a duplicate method was used was lower than the 0.040 mg/kgbw/d reported for 1.5-3 year old children living in fluoridated Indianapolis, US ^(17,27) and Piracicaba, Brazil ⁽²⁸⁾ and 4-6 year olds living in optimally fluoridated Bauru, Brazil ⁽²⁹⁾. However, it was higher than 0.019 mg/kgbw/d and 0.018 mg/kgbw/d reported for 3-4 and 4-7 year old children living in water fluoridated communities of New Zealand ⁽¹¹⁾ and Brazil ^(28,30). Conversely, for another group of 1-3 year old Brazilian children living in fluoridated Ibia and Bauru ^(6,28) the reported DDFIs of 0.027 mg/kgbw/d and 0.025 mg/kgbw/d were close to the findings of the current study.

The present study's estimate for DDFI when a 3- FD method is used can be compared with those reported for UK and Iranian children since those studies also used a food diary method to collect dietary data ^(12,30). The DDFI for children in the present study at 0.025 mg/kgbw/d was similar to that reported for 6-7 year old UK children ⁽¹²⁾, but lower than the 0.049 mg/kgbw/d reported for 4 year old Iranian children ⁽¹⁸⁾. Within these studies which used the same dietary methods, differences in the preparation of food as well as in dietary habits could have contributed to the differences in DDFI. Between those studies which have used different dietary methods, discrepancies in DDFI could also be attributed to the use of different dietary data collection methods.

A recent study in the US ⁽¹⁷⁾ employed and compared the same two dietary methods used in this study on a group of 15-30 month old children. The mean (SD) DDFIs of 0.038 (0.011) and 0.040 (0.016) mg/kgbw/d obtained when dietary data were collected by food diary and duplicate plate methods respectively, were higher than the corresponding values obtained in the current study. Age differences between American children and those from current study could have contributed to the difference in DDFI as dietary habits/consumption patterns of children vary depending on age. In addition, the actual F content of food and drinks consumed by the US children might have been higher. Based on the individual dietary sources, the present study found a similar F intake from food between the two methods, while in the US study a higher F intake from food was reported when the food diary method was used; 0.188mg/d compared with 0.130 mg/d reported for the duplicate plate method. In the present study a statistically significantly higher F intake from all drinks including water was observed when using 2-d DP; whereas for the US children, no statistically significant

difference in DDFI from drinks was reported between the 2 methods. Higher F intakes from water have been reported for Iranian ⁽¹⁸⁾, and Brazilian ⁽²⁹⁾ children due to increased air temperatures during summer, however, drinks consumption for the children in the present study was not affected by seasonal temperature since in north east England, where data collection was performed, seasonal temperature variation is low. During data collection, between April and November, the mean annual temperature was 9°C ranging from 2°C in December to 16°C in August ⁽³¹⁾.

In this study the lack of a statistically significant difference in the mean DDFI estimated by the 3-d FD and 2-d DP methods at group level suggests that either method can be used at the population level to estimate DDFI. There are many potential sources of errors in any dietary assessment method and although these may cancel each other out at the group level, they might introduce a large source of error at the individual level. To investigate this, the agreement between the methods at the individual level was also examined by using linear regression analysis. The use of linear regression in preference to the Bland-Altman method ⁽³²⁾ in the present study was mainly due to the proportional bias which was observed in the Bland-Altman plot and which was not removed after log transformation of data. Based on regression analysis, at an individual level the agreement in estimating F intake (mg/kg bw/d) using the 3-d FD method compared with the 2-d DP method was within ± 0.011 (95% CI 0.009-0.013) mg/kgbw/d.

This typical error although small, may put individuals in a different F intake category due to the narrow margin between suggested optimal and excessive F intake, as observed in the current study (Figure 1). This is particularly important when a study aims to determine the percentage of children with optimal, sub-optimal or excess F intake in order to plan a community-based fluoridation scheme. These findings suggest that DDFI data obtained by one of these dietary methods cannot replace those obtained by the other method when individual's intakes are compared.

Some authors have suggested ⁽¹⁷⁾ and/or used both methods ^(11,33) in their studies in order to check the validity of collected duplicate diets. Although this approach might enhance the reliability of duplicated dietary data, the feasibility of such approach should be considered carefully since it creates extra work for participants which may affect the compliance rate and the tendency to under-report. In addition, the use of both methods alongside each other in large scale studies might not be practical and the feasibility of this approach would benefit from further investigation.

Generally, none of the dietary assessment tools have been validated and/or calibrated for measurement of dietary F intake in any population. Therefore, validation and calibration studies are needed to develop a universal standardised dietary assessment method to assess dietary F intake over time within a population as well as compare population F intakes and body burden between countries. Among different dietary assessment methods, the 7-day weighed food diary, referred as the ‘gold standard’ method ⁽¹⁰⁾, has been used for calibration studies. However, validation studies have usually used 24-hour urine as a biomarker to compare intake of a nutrient assessed from a dietary method against levels estimated from urine samples.

The reliability analysis showed a greater typical day-to-day within-child variation with the 3-d FD method compared with the 2-d DP method. Within-child variation in fluoride intake for the US children was also reported to be higher when the food diary method was used.

However, the extent of variation in DDFI within-child was smaller than the variation found in this study. This could be due to recruiting children from a single day-care centre with identical food menus and limited choice of food, while in the present study variation in food types was greater since the majority of children had their own packed lunch and also the possibility of swapping their food/snacks with friends. The other possibility which may have contributed to a smaller variation in DDFI seen in the US children is that dietary data for those children were only collected on weekdays which, according to the authors, were to avoid variations in diet during weekends. In contrast, in the current study dietary data collection covered both week days and weekend days.

Greater within-child variation in DDFI found when the food diary method was used also suggests an ability of this method to capture more variations compared with the duplicate method. This could be due to more detailed recording of consumed food and drinks, although it should be noted that recalling such detail can sometimes be difficult for participants, resulting in researchers being tempted to use assumptions.

Conclusion

At the group level, either of the two dietary methods (2-d DP or 3-d FD) is suitable for estimating DDFI. However, at an individual level, due to the narrow margin between optimal and excessive F intake, DDFI data obtained by one of these methods cannot replace those data estimated from the other method during the same data collection period. A validated standardised dietary assessment method is needed to monitor dietary F intake over time and also enable multi-country comparisons.

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Table 1. Comparing the mean (SD) estimated weight (g) of foods, drinks and water consumed, measured by 3d-FD and 2d-DP methods.

Source	Mean (SD) weight (g)				Mean difference (95% CI)	P value
	3-day food diary		2-day duplicate			
	Mean	SD	Mean	SD		
- Total drinks	432	245	533	233	-100 (-151, -48)	0.001*
- Water	139	177	204	214	-64 (-97, -32)	0.001*
- Other Drinks	293	255	329	219	-35 (-80, +9)	0.12 ^a
- Foods	839	233	734	193	+105 (+50, +160)	0.001*
Total	1271	349	1266	311	+5.25 (-66.8, +77.3)	0.88 ^a

*statistically significant

^aNot statistically significant

Table 2. Comparison of mean F intake from each dietary source (in mg/d) and mean total daily dietary F intake (DDFI) estimated by 3d-FD and 2d-DP methods (in mg/d and mg/kgbw/d)

Source	Dietary fluoride intake				Mean difference (95% CI)	P value
	Mean (SD)					
	3d-FD		2d-DP			
	Mean	SD	Mean	SD		
DDFI (mg/d) from:						
All drinks	0.266	0.218	0.357	0.221	-0.091 (-0.140, -0.043)	0.001*
- Water	0.132	0.173	0.199	0.205	-0.067 (-0.099, -0.036)	0.001*
- Other drinks	0.134	0.194	0.158	0.173	-0.024 (-0.067,+0.019)	0.30 ^α
Food	0.267	0.183	0.225	0.101	+0.041(-0.001, +0.084,)	0.06 ^α
Total DDFI (mg/d and mg/kg bw/d):						
- mg/d	0.533	0.319	0.583	0.263	-0.050 (-0.109, +0.009)	0.10 ^α
- mg/kg bw/d	0.025	0.016	0.028	0.013	-0.003 (-0.006, +0.000)	0.10 ^α

* Statistically significant

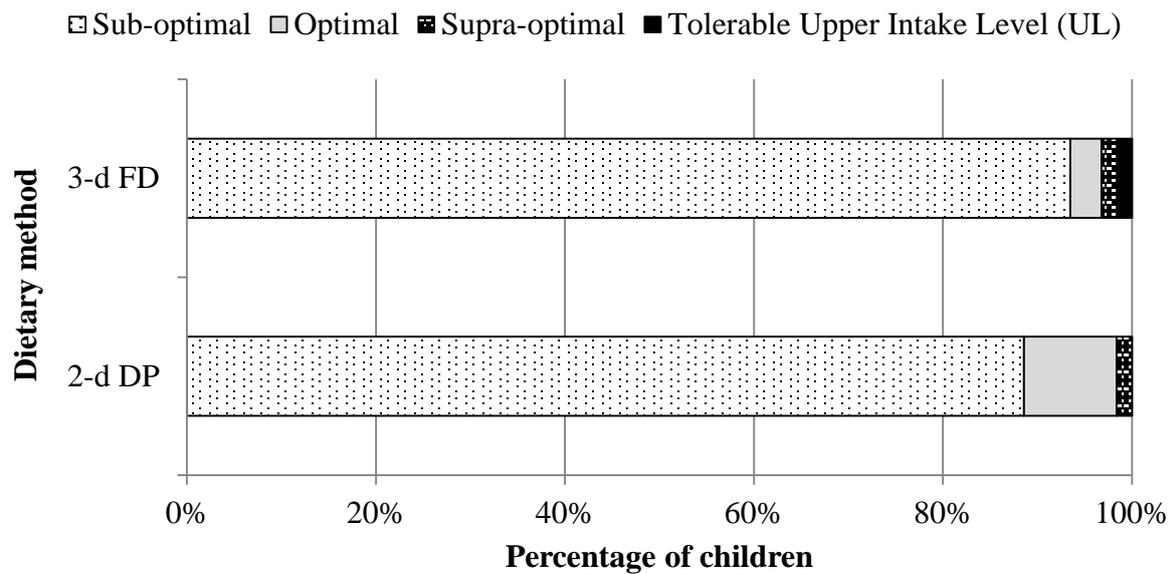
^αNot statistically significant

Table 3. Comparison of within-child day-to-day variability in DDFI (mg/d) estimated by each dietary method.

Method	Mean (SD) DDFI (mg/d)						Typical within-child variability (95% CI)
	Week day Day 1		Week day Day 2		Weekend day Day 3		
	Mean	SD	Mean	SD	Mean	SD	
3d-FD	0.555	0.419	0.508	0.342	0.536	0.411	±0.280 (0.240, 0.340)
2d-DP	-	-	0.574 ^a	0.308	0.592	0.283	±0.191 (0.160, 0.230)

^aThis is the first day for 2-d DP method

Figure 1. Percentage of children with suggested sub-optimal (<0.05 mgF/kg bw/day), optimal (0.05 - 0.07 mgF/kg bw/day), supra-optimal (>0.07 - <0.1mgF/kg bw/day) and Tolerable Upper Intake Level (UL) F intake (≥ 0.1 mgF/kg bw/day) by the method of data collection - 3-day food diary (3-d FD) and 2-day duplicate plate (2-d DP)



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