

Fruits and vegies in lunchboxes – accuracy of a prospective 24-hour food record for primary school children

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Introduction

Most Australians have an inadequate fruit and vegetable intake,¹⁻³ thereby increasing their risk of many cancers, cardiovascular and coronary disease.⁴⁻⁶ While pre-schoolers have sufficient intakes, adequacy declines as age increases.^{3,7,8} By supporting and promoting high intakes of fruit and vegetables in primary schools, the Tooty Fruity Vegie (TFV) project aimed to prevent this substantial decline during primary school years.⁹ A major challenge was how to measure the project's impact on children's fruit and vegetable intakes. Given a limited budget and a desire for high response rates from more than 2,000 children across 16 geographically dispersed primary schools, invasive and face-to-face methods were discounted. A literature review suggested prospective food records, with good instructions, were the next best option as they could be completed by Year 4 and older children and produced good

response rates.¹⁰⁻¹² Therefore, a prospective 24-hour TFV food record was developed for completion by parents or older children (Years 4-6), with parental help. As an indicator of how accurately the TFV food records were completed, reported lunchbox contents (the only observable component) were compared with actual fruit and vegetable contents.

Methods

Sample

The first primary school scheduled for data collection in the main TFV project agreed to participate in this validity study: 325 children were enrolled at the school.

Materials

The TFV food record was designed for completion by parents or by older children, with parental help. Accompanying

Abstract

Issues addressed: To explore the accuracy of reported fruit and vegetable contents of primary school children's lunchboxes compared with observed lunchbox contents as an indicator of overall accuracy of completion of a 24-hour food record developed for the Tooty Fruity Vegie (TFV) project.

Method: Parents or older children completed the TFV food records, including a section about foods packed in children's lunchboxes. As children arrived at school the next day, trained observers compared lunchboxes' actual fruit and vegetable contents against reported information. Comparisons were made for 241 children (76% response rate). Pearson's correlations tested agreement between amounts of fruits and vegetables reported on TFV food records and those observed in corresponding lunchboxes. Paired *t*-tests assessed differences between the two methods. As many children had no fruits and/or vegetables in their lunchboxes, analyses were conducted: 1) for all children; and 2) for only those with fruits and vegetables.

Results: Amounts of fruits and vegetables observed in children's lunchboxes were very similar to those reported in TFV food records, with non-significant mean differences of less than 0.005 serves for both. Lunchbox observations remained highly correlated with TFV food records even when only children with fruits or vegetables were included.

Conclusion: The TFV food record accurately measured fruits and vegetables in children's lunchboxes. While offering reasonable confidence in overall reported fruit intakes, further research is needed to confirm the accuracy of overall reported vegetable intakes.

Keywords: Food records, fruits and vegetables, validity, children.

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So what?

The TFV food record is a useful and acceptable tool for monitoring children's fruit and vegetable intakes.

instructions explained how to complete the TFV food record by noting (using standard household measures) all foods and drinks given to each child or packed in their lunchboxes, as well as recording any leftovers, during the 24-hour period (copies available from authors). For ease, the TFV food record was divided into eight sections, each representing a possible eating period: the way home from school, when first home from school, evening meal, after dinner snacks, breakfast, packed for lunch or recess, bought on way to school and bought at school (the last two were asked of children by observers).

Procedure

The school newsletter advertised that a nutrition project would be conducted at the school in the coming year. Parents were informed they would be asked to complete food records for their children and assured no individual child's results would be identified. To minimise reactivity, no dates were advised, fruits and vegetables were not identified as the target food groups and the subsequent lunchbox observations were not mentioned. On the day the 24-hour recording period started, trained observers attended the school, unannounced to parents and children. They distributed blank TFV food records, with cover letters and instructions, asking children to return them the next day, when they revisited each child and compared information in the 'packed for lunch or recess' section of their completed TFV food record with each child's lunchbox contents. Children were asked if they had eaten anything from their lunchboxes prior to the observation, with any items and quantities being recorded. Any discrepancies in serve sizes or types of fruits and vegetables were noted on the TFV food records.

Observer training

Observers (mainly local community health staff) attended a two-hour training session on recording fruits and vegetables in lunchboxes and identifying differences between observed and recorded serve sizes.

Analyses

Amounts of fruits and vegetables reported on TFV food records and observed in lunchboxes were converted to standard serve sizes⁸ (using a comprehensive coding tool developed for the project and currently being reviewed for publication) and analysed using SAS statistical software. As the data were non-normally distributed, Pearson's correlations tested agreement between TFV food records and lunchbox observations regarding fruit and vegetable serves. However, as the differences between the methods were normally distributed, paired *t*-tests assessed whether these differences were significantly different from zero. Many children had no fruits and/or vegetables either reported or in their lunchboxes, thereby increasing the likelihood of agreement between report and observation. Therefore, separate

Table 1: Comparing fruit and vegetable serve sizes recorded by parents and observed in children's lunchboxes (n=241).

	Fruits (150 g serves)		Vegetables (75 g serves)	
	Parent report	Lunchbox observation	Parent report	Lunchbox observation
Minimum	0.000	0.000	0.000	0.000
Maximum	3.300	3.300	2.000	2.000
Mean	0.627	0.626	0.090	0.087
Std dev	0.650	0.642	0.303	0.297
Median	0.500	0.500	0.000	0.000
Correlation	$r=0.96, df=240, p<0.0001$		$r=0.99, df=240, p<0.0001$	

analyses were conducted for: 1) all children, regardless of their recorded or actual lunchbox contents; and 2) only those children with some fruits and/or vegetables either recorded or observed.

Ethics

The Tooty Fruity Vegie project, including this validation sub-study, was reviewed and approved by the Northern Rivers Area Health Service Human Research Ethics Committee and the NSW Department of Education and Training's Strategic Information and Reporting Section.

Results

Response rate and sample characteristics

Six children were absent during the data collection, leaving 319 eligible children, of whom 241 (76%) had completed TFV food records, with similar response rates across genders and age groups.

Comparing food records for all children

As shown in Table 1, fruit and vegetable amounts observed in children's lunchboxes were very similar to those reported on TFV food records. Differences between paired observations were minimal (mean difference for fruit=0.001 serves and for vegetables=0.003 serves) and not significantly different from zero (paired $T \{ \text{fruit} \} = 0.150, df=240, p=0.88$; paired $T \{ \text{vegetable} \} = 1.178, df=240, p=0.24$).

Comparing food records for children with some fruit or vegetable items

Overall, 82 children (34%) had no fruits or vegetables in their lunchboxes, 129 (54%) had fruits but no vegetables, 12 (5%) had vegetables but no fruits and 18 (8%) had both. As shown in Table 2, when only children with fruits and vegetables were included, lunchbox observations remained highly correlated with TFV food records. Similarly, differences between paired observations also remained minimal (mean difference was 0.02 serves for both fruits and vegetables) and not significantly different from zero (paired $T \{ \text{fruit} \} = 1.267, df=142, p=0.21$; paired $T \{ \text{vegetable} \} = 1.185, df=29, p=0.25$).

Discussion

These results indicate the TFV food record very accurately assessed fruits and vegetables packed in children's lunchboxes. As the fruit in children's lunchboxes averaged about half their daily intake (from analyses of their whole food records), the TFV food record likely gives an accurate representation of overall fruit intakes. However, as only 12% of the children's lunchboxes contained any vegetables, representing under one-tenth of these children's overall vegetable consumption in the 24-hour period, more caution is needed regarding the accuracy of overall vegetable intake figures.

Funding and logistic restrictions prohibited blinded observations of fruits and vegetables in the children's lunchboxes. While stringent observer training was used to minimise any bias, lower rates of agreement may have resulted if observations had been conducted independently of the TFV food record. However, it is unlikely any such differences would have reduced the correlations achieved to an unacceptable level. Similar restrictions also prohibited having a longer reporting period, which would have allowed more precise estimates of each child's daily intakes – by averaging intakes over a number of days.

A strength of this study was that both children and parents were unaware lunchboxes would be inspected when completing the TFV food records, making it unlikely they took extra care when doing so, lending credibility to the findings, as does the high response rate.

Conclusions

The TFV food record is a useful and acceptable tool for monitoring children's fruit and vegetable intakes. While offering a high level of confidence in overall reported fruit intakes, further research is needed to confirm the accuracy of overall vegetable intakes.

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Table 2: Comparing fruit and vegetable serve sizes recorded by parents and observed in children's lunchboxes – excluding agreed zero counts.

	Fruits (150 g serves) n=147		Vegetables (75 g serves) n=30	
	Parent report	Lunchbox observation	Parent report	Lunchbox observation
Minimum	0.000	0.000	0.250	0.250
Maximum	3.300	3.300	2.000	2.000
Mean	1.029	1.026	0.721	0.701
Std dev	0.528	0.514	0.537	0.536
Median	1.000	1.000	0.500	0.500
Correlation	r=0.89, df=146, p<0.0001		r=0.99, df=29, p<0.0001	

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