



Fruit and Vegetable Consumption in Rural Victorian School Children

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Abstract

Fruit and vegetable consumption is accepted as the cornerstone of healthy eating practices. In turn, healthy eating is linked to the prevention of a number of chronic diseases. Healthy eating practices should begin in early childhood and continue throughout life. This study aimed to determine fruit and vegetable consumption in children aged 6-12 years in three local government areas in rural Australia, and examines the factors which influence consumption, such as access, cost and parental education and behaviours.

Parents of school children in grades one and three from 41 schools completed a survey regarding fruit and vegetable consumption, and associated factors, for their child. Five hundred and forty four surveys were completed and returned. The results showed that while fruit consumption was within the recommended guidelines for 97% of children, only 12% ate the recommended serves of vegetables for this age group. The results did not vary between the age and gender of children nor parental income or education. Parental sources of knowledge for healthy eating was reported as predominantly family and friends as well as newspapers, internet and magazines.

Examining fruit and vegetable consumption separately highlighted the need for a focused intervention on increasing vegetable consumption in the three local government areas. The sources of parental knowledge provided important information for health promotion activities.

Keywords: Fruit and vegetable consumption; Rural; Children; Survey; Local government area (LGA)

Introduction

Adequate fruit and vegetable consumption can be linked to the prevention of a number of chronic conditions such as cardiovascular disease, diabetes, obesity and some cancers [1,2]. Healthy eating includes a dietary intake of a variety of fruit and vegetables which contributes to better overall health by providing a range of nutrients and dietary fiber [2,3].

In 2012, healthy eating was identified as a priority area by agencies funded for Integrated Health Promotion in the Goulburn Valley Primary Care Partnership (GVPCP) catchment area. Three Victorian local government areas (LGA) comprise the catchment: Greater Shepparton, Moira and Strathbogie Shire. They are geographically diverse areas, with varying population sizes (from 63,000 in Greater Shepparton to 10,000 in Strathbogie) and various primary industries. Heavily influenced by agriculture, the catchment is widely recognized as the 'food bowl' of Australia.

The percentage of adults meeting fruit and vegetable dietary guidelines was known to be low in the GVPCP catchment. Fifty five percent in Moira Shire, 53.9% in Greater Shepparton and 50.7% in Strathbogie were not meeting the recommended daily intake of fruit and vegetables [4-6]. The current Australian recommended daily intake for adults is two serves of fruit and five serves of vegetables [7].

The Australian Guide to Healthy Eating sets out specific recommended serves of fruit and vegetables for children aged 4-8 and 9-11 years [8]. One and a half servings of fruit and four and a half servings of vegetables are recommended for children aged four to eight years. Two serves of fruit and five serves of vegetables are recommended for children aged nine to eleven years. Serving sizes are specified as half a cup [8].

This study targeted school children aged six to ten years in Greater Shepparton, Moira and Strathbogie Shires. It was already known that 66.9% of children aged 4-12 years in the Hume Region (where these

LGAs are located) did not meet the daily recommended intake for fruit and vegetables [9]. No local government area data was available and all available regional data combined fruit and vegetable consumption as one measure. This study intended to identify consumption rates of fruit and vegetables separately at a local level to give more meaningful data. As well as providing an accurate baseline, the information would assist local organizations to tailor potential health promotion interventions that aim to increase consumption as well as measure the effect of any introduced interventions.

Parents influence children's consumption of food through modeling, purchasing and preparing food for their children [10]. There is a great deal of evidence from previous studies regarding the parental influence on children's fruit and vegetable consumption, thus parental behaviours, attitudes and beliefs are also important to capture [11-14].

Given parental influence on children's eating patterns, the secondary aim of the survey was to identify parents' sources of nutritional knowledge and perceived barriers to fruit and vegetable consumption. Proxy measures of childhood fruit and vegetable consumption, such as parental reporting, are common and were utilised for this survey.

Methods

Survey tool

The survey was developed over a period of four months by a project

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team comprised of two dietitians, four health promotion workers, a local government community wellbeing officer and a research academic. There were three iterations of the survey after trialing it twice to determine participant understanding and reliability. The survey was also informed by a rigorous literature review which had earlier been undertaken by the project team [15].

The survey included questions on demographic characteristics of the child and their parent/career; the child's intake of fruit and vegetables; barriers and enablers to fruit and vegetable intake; and types of resources parents use to access nutrition information. Parent/career demographic questions also included the highest level of education achieved; respondent's relationship to the child; and possession of a health care card. For the sake of brevity, other questions not reported included: cultural groups; healthy eating messages; other influences on family eating patterns; shopping habits and frequency; the structure of family meals; take away food consumption; and types of fluids consumed by children.

To measure intake of fruit and vegetable foods, the food record method was employed in the form of a matrix table that represented a typical day. Vegetable intake included fresh, frozen, cooked, raw and baked beans. Fruit intake included fresh, dried and tinned but excluded fruit juice. Respondents were given a page of food photographs that demonstrated standard serve sizes [16]. Examples of one serve were also described in the matrix, such as $\frac{1}{2}$ cup of cooked vegetables, 1 cup of salad. The weight of the serve was not included in the descriptor. In the matrix table, respondents were then asked to select how many daily serves their child ate from the following: none, 1, 2, 3, 4, 5 or more or do not know.

To measure barriers and enablers to fruit and vegetable intake a matrix table was again employed. Respondents were asked to agree or disagree with a range of statements relating to: perceived access and perceived cost of fruit and vegetables; ability to make healthy meals and snacks; self-perception of healthy food knowledge; child's food preference; importance of the child eating fruit and vegetables; preparation time of healthy meals; and rewarding with lollies or treats.

A collectively exhaustive multiple response questions were included to determine where parents and guardians usually get information and advice about healthy eating for his or her child. Responses included: family, friends, internet, TV, radio, doctor, maternal and child health nurse, dietitian, books or brochures, newspapers or magazines, library, own knowledge, parents with children of the same age, teachers or school and pharmacist. Respondents were also provided with a space to write other sources they used to access information.

Procedure

The study population was grade one and three students who attend primary schools in the three local government areas of Greater Shepparton, Moira and Strathbogie Shire in North East Victoria. Parents and guardians were invited to complete the survey about their child. No other inclusion or exclusion criteria were set, however the survey was only provided in English language.

Approval to conduct the study was granted by the Goulburn Valley Health Human Research Ethics Committee and the Department of Education and Early Childhood Development. Primary school principals were contacted directly by the research team by phone or email to provide information about the study and obtain consent to participate. The surveys, with a plain language statement were delivered to schools that consented. Teachers of grades one and three distributed

the surveys to their students to take home to their parent/guardians to complete. A collection box was placed at each school administration office for two weeks for participants to return completed surveys, as instructed in the plain language statement.

Statistical analysis

Data analysis was undertaken using SPSS (Statistical Package for Social Sciences) version 21 (IBM, Ireland). Descriptive statistics were generated for the demographic characteristics, food intake and sources of knowledge. Age groups of children were combined into 6-7 years and 8-10 years to allow further analysis with acceptable numbers in age categories. Pearson's Chi-Square tests were used to compare gender and age of children with vegetable intake. In addition, Pearson's Chi-Square tests were used to analyse relationships between child vegetable consumption and parental age, education level and health care card status as well as local government area. Pearson product-moment correlation coefficient and Spearman's rho were used to investigate the relationship between the perceived cost of fruit and vegetables and children's consumption of both. Median results are reported where distribution of scores was skewed, either positively or negatively.

Results

Response rate

Sixty primary schools from the three local government areas were invited to participate in the survey, with 41 schools (68.3%) consenting to being involved. Almost half (48.8%, $n=20$) of the schools were located in Greater Shepparton, with a further 41.5% ($n=17$) located in Moira, and 9.8% ($n=4$) in Strathbogie. A total of 556 surveys were completed out of 1933 surveys distributed, providing an overall response rate of 28.5%. Non responders were not asked the reason for non-response, as the researchers did not directly recruit, but relied on teachers to distribute the surveys via the children, who in turn gave them to parents. This chain increased the chances of non-response.

Response rates across local government areas varied, with Strathbogie producing the highest rate of 40.9% ($n=58$), Moira received 32.2% ($n=233$), and Greater Shepparton had a response rate of 24.4% ($n=256$).

Participants' characteristics

Participants in the study were parents or carers of school children in grades one and three of primary schools consenting to be surveyed.

Demographic information about the participants and their child is shown in Table 1. The majority ($n=498$) of parent/carer respondents identified as the mother of child, with 30 fathers also completing the survey. Of those who responded, the parents/carers listed first were mostly mothers (92.1%) and those listed second were mostly fathers (50%). The majority of respondents had completed tertiary level education (including Technical and Further Education); 60.2% ($n=331$) for parent/carer one and 46.6% ($n=256$) for parent/carer two.

Almost a third of overall respondents held a Health Care Card (HCC) (32.0%, $n=173$). The proportion of Health Care Card holders was slightly higher in Greater Shepparton (34.8%, $n=89$) and Moira (31.3%, $n=73$), in comparison with Strathbogie (25.0%, $n=14$).

The gender of children reported in the study showed an even representation of males (49%) and females (51%). The ages of children ranged from 6-10 years, with a median age of 7.5 years. There were 297 (54%) in the 6-7 year age group and 250 (46%) in the 8-10 year age group.

Eleven percent (n=61) of the sample met both the recommended guidelines for fruit and vegetable intake, with 2.7% (n=14) of the sample meeting neither guidelines. Children from the sample were reported as eating a median of 2.3 serves of fruit and two serves of

vegetables per day. Twelve percent (n=67) of sample were within the recommended four and a half to five serves of vegetables, with the majority (87.5%, n=476) not meeting the recommended guidelines for vegetable intake. A small proportion of children (3%, n=17) was not meeting the recommended guidelines of one and a half to two serves of fruit.

Characteristic	Subcategory	Total sample (n=541)	
		n	%
Relationship to child	Mother	498	92.1
	Father	30	5.5
	Grandparent	4	0.7
	Guardian	5	0.9
	Other	4	0.7
Carer 1			
Health Care Card	Yes	173	32.5
	No	359	67.5
		Median (IQR)	Range
Age (years)	39.2 (35,43)	23-73	
Carer 2			
		(n=470) 164 missing	
Relationship to child	Mother	20	3.6
	Father	275	50
	Grandparent	5	0.9
	Guardian	1	0.2
	Other	5	0.9
		Median (IQR)	Range
Age (years)	40.9 (37,44)	20-70	
Children			
Characteristic	Subcategory	(n=548)	
		n	%
Gender	Males	270	49
	Females	278	51
		Median (IQR)	Range
Age (years)	7.5 (7,9)	6-10	
Age groups (years)	6-7	8-10	

Table 1: Parent/guardian's and children's characteristics.

Because consumption of fruit met or exceeded the guidelines for 97% of children, further analysis focused on vegetable consumption, with the exception of cost. In addition, smaller numbers in the 6 year age group (n=54), 8 year age group (n=57), and 10 year age group (n=10), meant that ages 6-7 (n=297) were combined, as were ages 8-10 (n= 250) to undertake further analysis.

In Figure 1, there were equivalent numbers from both genders who did not meet the recommended guidelines for vegetable intake. A Pearson's Chi-Square test identified no significant difference between males (n=226, 42%) and females (n=240, 45%) not meeting the recommended four and a half to five serves of vegetables, p=0.087.

There was no relationship between the age of the child and vegetable consumption. A Pearson's Chi Square test revealed no significant differences between children in 6-7 year age group (n=253, 54%) and those in the 8-10 year age group (n=215, 46%) not meeting the vegetable guidelines, p=0.858.

Although the number of children who did not meet the recommended vegetable consumption was slightly higher in Shepparton (n=228, 92%) compared to Strathbogie (n=50, 86%) and Moira (n=190, 83%), this was not statistically significant, p=0.012. (Figure 1).

Differences in vegetable consumption between children with parent/guardians who were HCC holders, and those who were not, was further analysed and is (Figure 1). There was no significant difference between children not meeting the recommended vegetable intake of parents who were HCC holders (n=145, 86%) and those without a HCC (n=309, 88%), p=0.637. Similarly, the age of the parent/carer had no relationship to vegetable consumption in children, p=0.335.

Parental/carer education and vegetable consumption was further

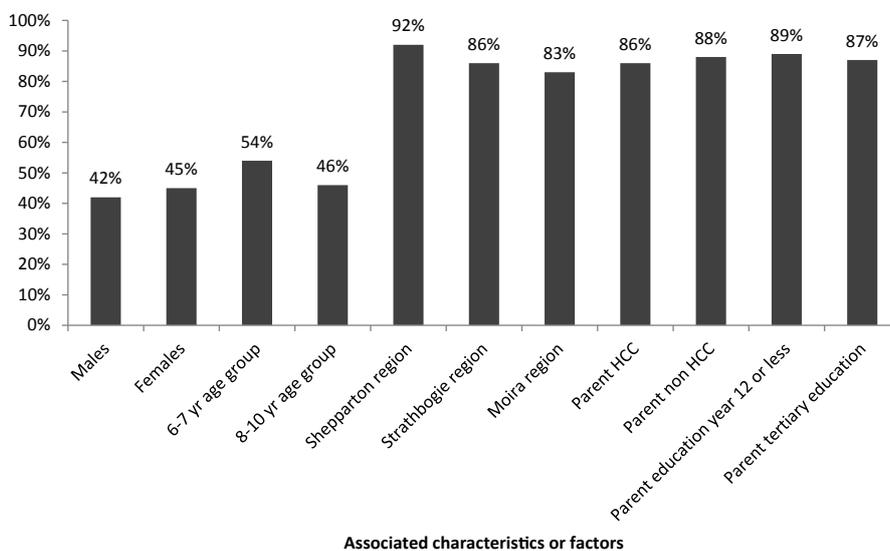


Figure 1: Percentage of children not meeting the recommended guidelines for vegetable intake and associated characteristics and factors.

explored. When considering the sample that did not meet vegetable guidelines, the number of parents/carers who had completed year 12 or less (n=175, 89%) was not significantly higher than those who had achieved a tertiary education (n=281, 87%), $p=0.351$. Figure 1 also shows the percentage of children who did not meet the guidelines broken down by parental education levels.

Barriers to fruit and vegetable consumption and healthy eating

Respondents were asked whether they agreed or disagreed with a series of statements relating to barriers to healthy eating. The statements and response rates are shown in Table 2.

Knowledge indicators produced a high level of agreement overall, whereby 95.8% (n=527) of respondents agreed to the statement 'I know how to make healthy meals for my child'. Access did not appear to be a barrier for the majority of the sample; 94.5% (n=520) agreed to the statement 'It is easy to get fresh fruit and vegetables'.

Forty percent (n=220) agreed to the statement 'Fruit costs too much' and 36.7% (n=202) agreed to the statement 'Vegetables cost too much'.

Child's food preferences were also explored as potential barriers to healthy food consumption, with particular focus on fruit and vegetables. Almost a fifth (n=99) of respondents agreed to the statement 'My child doesn't like vegetables'. A smaller proportion of respondents (6.7%, n=37) agreed to the statement 'My child does not like fruit'.

There was no statistically significant correlation between children's consumption of vegetables and parents/carers who reported that vegetables cost too much ($r=-0.05$). Similarly, there was no statistically significant correlation between children of parents/carers who reported that fruit costs too much and their consumption of fruit ($r=0.01$). Both relationships were investigated using Pearson product-moment correlation and Spearman's rho.

Sources of healthy eating knowledge

Survey participants were asked to report their main sources of information for healthy eating, using predetermined categories. Respondents were invited to select as many applicable categories as they liked. The major sources of information identified were: Family (57.8%, n=318); Friends (50.9%, n=280); Newspapers/magazines (49.8%, n=274); Internet (46.2%, n=254); and Book/brochures (39.8%, n=219).

Discussion

Only twelve percent of school children in this study were reported to be eating the recommended amount of fruits and vegetables. Although only a small proportion (3%) did not meet the recommended intake of fruit, 87.5% did not consume the daily recommended serves of vegetables. Analysis showed no relationships between the gender of the child; the local government area; or the age of the child or their parent and fruit and vegetable servings eaten. Although some survey respondents cited fruit and vegetables as being costly (40% for fruit and 36.7% for vegetables), this did not influence their children's rates of consumption compared to the rest of the sample. The parents/carers in the study perceived that they had knowledge of preparing healthy food (95.8%). Sources of knowledge for healthy eating varied, the highest being family (57.8%), friends (50.9%) and all popular media.

The high proportion of children meeting the recommended fruit intake, but low proportion meeting vegetables highlighted the potential for greater impact with an intervention that focuses on vegetable consumption.

Parents/guardians indicated that their child was more likely to dislike vegetables compared with fruit. Previous qualitative studies provide hypotheses to explain children's preference to eat fruit, rather than vegetables. Children perceive fruit to be sweet, juicy and fun to eat, while vegetables can be linked with negative sensory experiences [17-19].

This study found no significant difference between vegetable consumption and the child's gender, the results being similar for males and females, in contrast to other studies [18,20]. For adults, males are less likely to consume adequate quantities of fruit and vegetables than females [21]. The age of the children in this study was younger than those in other studies. Thus, the differences in preferences by gender may emerge with age, accounting for the lack of significance between genders in this study.

HCC status was asked in the survey as a proxy measure of income. To qualify for a HCC income must not exceed \$913 (AUD) per week for couples or single parents [22]. Slightly more than 31% of respondents were HCC holders. The results showed no correlation between vegetable consumption levels for children and parents who were HCC holders, compared to those who were not. This result may be explained by lower income in rural areas overall compared to urban areas, so the differences between those on a HCC and those not, do not have a marked difference in income in rural Australia [23].

Positive statements	Disagree		Agree	
	n	%	n	%
It is easy to get fresh fruit and vegetables	20	3.6	520	94.5
I know how to make healthy meals for my child	18	3.3	527	95.8
I know how to make healthy snacks for my child	23	4.2	512	93.1
It is important for my child to eat fruit and vegetables	4	0.7	540	99.1
Negative statements	Disagree		Agree	
	n	%	n	%
Fruit costs too much	304	55.3	220	40.0
Vegetables cost too much	327	59.5	202	36.7
I'm not sure what healthy foods are	538	97.8	9	1.6
My child doesn't like fruit	507	92.2	37	6.7
My child doesn't like vegetables	443	80.5	99	18.0
Healthy meals take too long to prepare	497	90.4	34	6.2
Sometimes it seems like the only way to get my child to behave is to promise lollies or other treats	487	88.5	52	9.5

Table 2: Responses to positive and negative statements about healthy eating.

There is evidence that children living in households with an income of less than \$40,000 (AUD) in rural Victoria are more likely to not meet the recommended guidelines for fruit and vegetable consumption [24]. In addition, previous studies show that adults who are unemployed or who have low annual household income are more likely to have inadequate consumption of fruit and vegetables [21].

Surprisingly given the rurality of respondents and limited transport in some of the local government areas, physical access to fruit and vegetables did not appear to be a barrier for the majority of survey respondents, which is consistent with previous studies [25]. When asked about affordability, an alternate determinant of access, some respondents perceived fruit and vegetables to cost too much. One previous study [26] found that healthy foods were more expensive in rural areas, compared with metropolitan areas. There is limited data comparing rural and metropolitan healthy food prices. In this study, when comparing consumption of fruit and vegetables with the perception that fruit and vegetables cost too much, no differences were observed. Dibsall, Lambert, Bobbin and Frewer, (2002) proposed that lack of money may be identified as the barrier to fruit and vegetable intake when there could actually be other, more complex causes.

Respondents reported good levels of knowledge of healthy foods and preparing healthy meals and snacks. A high proportion of parents/carers indicated that they knew how to make healthy meals for their child; however this did not translate into children meeting the recommended serves of vegetables. The low consumption of vegetables may indicate a discrepancy in perceived knowledge compared to actual knowledge. Dibsall et al. (2002) reported that low-income participants in their study believed they were already eating healthy irrespective of their low consumption levels of fruit and vegetable. The alternative explanation for this discrepancy is the inability to translate nutrition and food preparation knowledge into healthy eating behaviours in their children. Previous studies [18] also highlighted that knowledge in itself is unlikely to bring about healthy eating behaviour change. Several other extrinsic and intrinsic factors influence the ability to make changes. In Dibsall et al's (2002) study, motivation and lifestyle factors in particular were raised as barriers to healthy eating.

The sizeable proportion of respondents who identified that family and friends were their main sources of healthy eating information underscores the influence that informal social networks can have on eating habits and the importance of considering this when planning health promotion interventions. Other major identified sources of nutrition information, such as Newspapers/magazines, Internet and Books/brochures could be media of choice when planning social marketing strategies.

Limitations

The study utilised a non-validated, self-developed tool which the authors acknowledge has limitations. Also, due to the non-random sampling method applied, results from the study cannot be generalised to the broader population.

Parental knowledge of recommended serves of fruit and vegetables was not tested in this study, due to national advertising campaigns and easy access to the information. The study focused on actual consumption and potential barriers.

Because parental knowledge of recommended consumption of fruit and vegetables was not tested, the study did not determine if the barriers to consumption were linked to poor knowledge or simply lack of knowledge translation into practice, behaviour, or both.

Social desirability bias may have influenced estimates of fruit and vegetable intake, meaning that consumption may be even lower than reported. Knowledge of preparing healthy meals may also be affected by social desirability bias – parents wish to appear adequate.

Although the response rate of 28.5% could be considered low, a study of response rates of six well regarded journals found that the average response rate was below 40% [27] it is unwise to define a level above which a response rate is acceptable, as this depends on many local factors [28]. While it is acknowledged that non-response bias represents a significant threat to validity, high response rates are also found to contain bias [29].

Conclusion

This study gathered local government area level fruit and vegetable consumption data for children, which was previously not available.

The study confirmed the need for nutrition intervention in the Goulburn Valley catchment area. It further identified that vegetable consumption should be the focus of future interventions, rather than fruit and vegetables together.

Results highlight the complexity of influences on fruit and vegetable consumption. Determinants of consumption of fruit and vegetables are widely documented in the literature and include price, access, attitudes and knowledge. A series of attitudinal statements in the survey were intended provide insight into the obstacles faced by parents and identify where strategies may be implemented. Study findings were consistent with broader literature that found discrepancies between parental knowledge of healthy foods and adequate consumption of vegetables in children. Strength of the study was provision of photographic page of serving sizes which allowed more accurate measurement of actual consumption. No information was provided on recommended guidelines to avoid socially desirable responses.

Recommendation

Education interventions alone that are aimed at individuals are unlikely to bring about changes to behaviour. A socio-ecological approach to healthy eating is recommended which considers multiple spheres of influence [30] such an approach acknowledges broader impacts on children's eating habits beyond the individual and family context. Environmental influences where children live learn and play has an important role in determining what types of foods are available and accessible to children. Policy initiatives that focus on ensuring children's environments are supportive of healthy eating culture include interventions such as Health Promoting Schools, a settings-based initiative that encourages healthy school food policies and role modelling by staff [31]. Education settings have frequently been used as the target for health promotion interventions aimed at children. Schools and early childhood centres are embedded in broader communities and thus interventions must be designed to work with and meet the distinct local needs of these communities, in order to have long-term sustainable impacts.

With the common goal to increase vegetable consumption across the catchment, a coordinated approach using a mutually reinforcing plan across the three LGAs would optimise collective impact. A practice framework that allows for differentiated activities in each LGA that contribute to achieving one common goal is required. Healthy Food Connect [32], a model that addresses local food system change has been identified through an extensive systematic selection process, to be suitable for nutrition intervention across the Goulburn Valley

catchment. The model aims to identify possible activities, strategies and policy changes that will create supportive environments to ensure that healthy eating choices are the easy and preferred choices for children, families and communities overall.

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