Vegetable and fruit breaks in Australian primary schools: prevalence, attitudes, barriers and implementation strategies

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Abstract

School-based vegetable and fruit programs can increase student consumption of vegetables and fruit and have been recommended for adoption by Australian schools since 2005. An understanding of the prevalence and predictors of and the barriers to the adoption of school-based vegetable and fruit programs is necessary to maximize their adoption by schools and ensure that the health benefits of such programs to children are realized. The aim of this study was to determine Australian primary school Principals’ attitudes and barriers to the implementation of vegetable and fruit breaks; the prevalence of vegetable and fruit breaks in schools and the implementation strategies used and associated with their recommended adoption (daily in at least 80% of classes). A random sample of 384 school Principals completed a 20-min telephone interview. While Principals were highly supportive of vegetable and fruit breaks, only 44% were implementing these to a recommended level. When controlling for all school characteristics, recommended vegetable and fruit break adoption was 1.9 and 2.2 times greater, respectively, in schools that had parent communication strategies and teachers trained. A substantial opportunity exists to enhance the health of children through the adoption of vegetable and fruit breaks in schools.

Introduction

Studies in the United States, United Kingdom and Australia have found that between 70 and 80% of children aged 5–18 years fail to meet national recommendations for daily vegetable and fruit intake [1–3]. For children, consumption of vegetables and fruit can help protect against respiratory diseases [4] and excess weight gain [5, 6]. Furthermore, longitudinal studies have shown that high intake of vegetables and fruit in childhood may reduce the risk of chronic diseases including stroke and cancer later in life [7–9]. Given the importance of vegetable and fruit intake during childhood, the implementation of population-based programs to increase vegetable and fruit intake has been recommended [10, 11].

Schools play an important role in the development of health behaviours in children [12] and represent, for a number of reasons, valuable settings for population-based health programs that encourage vegetable and fruit intake. Firstly, schools can reach a large number of students on a continuous and intensive basis during crucial phases in their development of dietary habits [13]. Secondly, schools have a mandate to encourage healthy eating through the curriculum and have personnel skilled in delivering health and well-being messages in an appropriate manner [14, 15]. Thirdly, the social environment of schools can provide students with opportunities to learn about, observe and practise
healthy eating behaviours [15, 16]. Fourth, schools have established links with support networks in terms of student peers, care givers and the local community, who are able to reinforce health messages taught at school [15, 17, 18]. Finally, systematic reviews have consistently reported that multi-strategic school-based vegetable and fruit interventions can increase children’s daily serves of vegetables and fruit [19–25].

Despite the attractiveness of schools as an intervention setting, school adoption of government programs to promote child vegetable and fruit consumption has been mixed. National distribution schemes which provide free vegetables and fruit to students at school have been implemented by school systems in the United Kingdom [2], the United States [26] and New Zealand [27]. Low rates of program adoption (<30%), however, have been found for those national distribution programs which provide subsidized as opposed to free vegetables and fruit for children to consume at school [28] or require schools to source funding to permit vegetable or fruit consumption [29]. As an alternative to such school-based vegetable and fruit distribution programs, the Australian Government recommended, in 2005, that all primary schools implement a vegetable and fruit break program (Crunch&Sip®) that provides a time in class for children to consume a piece of vegetable or fruit they had brought from home [30]. Schools were recommended to implement the program in at least 80% of school classes on every school day. To support establish and sustain the program, schools were also encouraged to implement supportive school policies, curriculum material and parent communication strategies. Resources were made available to facilitate the implementation of these strategies. To our knowledge, no other government initiated program designed to encourage adoption of a school-based vegetable and fruit program like Crunch&Sip® that requires families to supply vegetables or fruit has been reported. Similarly, to date, no peer-reviewed evaluation of the extent to which Australian schools have implemented the Crunch&Sip® or similar school-based vegetable and fruit breaks has been reported.

Low program adoption by schools can limit the population impact of vegetable and fruit programs. The barriers which hinder school adoption of programs to encourage vegetable and fruit intake during childhood have not been previously reported in the peer-reviewed literature. International evidence regarding the implementation of school-based health promotion programs generally, however, suggests that schools often face a number of barriers to the implementation of health promotion initiatives [31–33]. These barriers include an already ‘crowded curriculum’, inadequate resources to implement programs, limited support from school executive staff, a lack of training for school staff and poor communication strategies between teachers and parents limiting the extent to which health messages are reinforced at home [31]. Other school characteristics, such as number of students and socio-economic and geographic characteristics, have also been associated with uptake of health policies and practices [32, 33].

Organizational change frameworks draw on a variety of theoretical constructs to guide interventions to improve organizational practices such as diffusion of innovation theory, the trans theoretical model of behaviour change, social influence and social ecological theory [34]. Collectively, such frameworks and theory would suggest that, in order to facilitate adoption of a new program in schools, strategies are required that seek to garner support for program adoption among those with school influence; ensure that those required to make changes to current practices have the necessary knowledge and skills to do so; create a school environment which is supportive of program adoption and, importantly, tailor such strategies to address the specific barriers to adoption as identified by schools. Systematic reviews of such practice change strategies in schools and other settings provide empirical evidence that support the effectiveness of such a multicomponent and tailored approach to achieving organizational change [35–37].

Within the school setting, systematic reviews of the literature have also identified a number of school implementation practices associated with successful adoption of school-based health promotion
programs generally and vegetable and fruit programs specifically [22]. These implementation strategies include the development of a school nutrition policy, implementation of curriculum material with a particular focus on vegetables and fruit (as opposed to general healthy eating messages), teacher training in program delivery and parent engagement strategies [22]. Such strategies are consistent with organizational change theoretical frameworks [34] and the World Health Organisation’s health-promoting schools approach to program implementation in schools [31].

An understanding of the prevalence and predictors of and the barriers to the adoption of school-based vegetable and fruit programs is necessary for ensuring that the intended benefits of such programs are to be realized. Furthermore, such information may have relevance to the adoption by schools of other health promotion programs more broadly. To this end, a study was undertaken to describe school Principals’ attitudes and reported barriers to the implementation of vegetable and fruit breaks in Australia; the prevalence of vegetable and fruit breaks in Australian schools and the school characteristics and implementation strategies associated with school vegetable and fruit breaks.

Methods

Ethical approval

Approval to conduct this study was obtained from Hunter New England Area Health Service (HNEAHS) Human Research Ethics Committee (no. 06/07/26/4.04) as well as the New South Wales (NSW) Department of Education and Training (DET) and the relevant Catholic Schools Offices.

Design and setting

A cross-sectional survey of primary and central schools was conducted in the state of NSW, Australia. NSW has a population of approximately 863 000 children aged between 5 and 14 years [38].

Sample

The sampling frame consisted of all Government and non-Government (Catholic and Independent) primary (children 5–12 years of age) and central schools (children 5–18 years of age). A database of all eligible schools was generated from information provided on the Websites of the Department of Education and Training [39], the Catholic Education Commission [40] and the Association of Independent schools [41]. Special purpose schools (such as those for students with special needs, juvenile justice or schools serving children who are hospitalized) were excluded. A random sample of 479 eligible schools (49%), stratified by school type (Government and non-Government), was selected.

Recruitment and data collection procedures

Principals of all selected schools were sent an information letter inviting them or a nominated delegate to participate in the study. Two weeks following the receipt of the invitation, Principals were telephoned by a trained research assistant, who confirmed school eligibility and sought participant consent. A 20-min Computer-Assisted Telephone Interview (CATI) was conducted with consenting Principals or their nominated delegate (hereinafter referred to as Principals). The survey was conducted over the 2008/09 summer period. Principals from central schools were asked to report on activities relevant to primary school age classes (5–12 years) only.

Measures

School characteristics

Data regarding school type (Government, non-Government Catholic or non-Government Independent) and the post-code of the geographic locality of the school were obtained from school Websites. During the telephone interview, Principals were asked to report the number of students attending the school.

Attitudes to vegetable and fruit breaks

A vegetable and fruit break was defined as ‘a time or specific break when students have permission to
eat vegetables and/or fruit during class time’. To assess attitudes regarding vegetable and fruit breaks, Principals were asked to respond on a four-point Likert scale (1 = strongly agree to 4 = strongly disagree), whether they felt that it is part of a school’s role to provide an environment which encourages healthy eating; that it is appropriate for schools to implement vegetable and fruit breaks (as defined above) and that vegetable and fruit breaks do not take away too much time from other educational priorities in the classroom or are disruptive to classroom routine.

**Barriers to vegetable and fruit breaks**

Principals were asked via a free-response item to report the barriers that they perceived hindered the implementation of a vegetable and fruit break in their school.

**Prevalence and characteristics of vegetable and fruit breaks**

Principals were asked to report if, in the last year, classes at their school had specific breaks for children to eat vegetables or fruit during class time (‘yes all classes’, ‘yes some classes’, ‘no classes’, ‘don’t know’). Principals who reported that some classes at their school had a vegetable and fruit break were asked to estimate the percentage of classes that had such breaks. Principals who reported that classes at their school had a vegetable and fruit break were asked to estimate the number of days per week the break usually occurred.

**Program implementation strategies**

To describe the extent to which schools implemented strategies to facilitate the adoption of a vegetable and fruit break, Principals were asked whether the school had a written policy regarding vegetable and fruit breaks (yes/no/don’t know); if teachers used lesson plans addressing vegetables, fruit or water consumption (yes/no/don’t know); had the school communicated with parents regarding healthy eating and/or physical activity programs or policies in the school (yes—healthy eating/yes—physical activity/yes—both healthy eating and physical activity) and whether teachers had been provided training or professional development regarding the implementation of vegetable and fruit breaks (yes/no/don’t know).

**Analysis**

All analyses were conducted using the statistical package SAS Version 9.2 [42]. Descriptive statistics were used to describe school characteristics, Principal attitudes, barriers to vegetable and fruit breaks and program implementation strategies. The reported number of enrolled students in each school was used to categorize schools as: ‘small schools’ (1–159 students); ‘medium schools’ (160–450 students) or ‘large schools’ (451+ students). Schools with post-codes ranked in the top 50% of NSW post-codes based on the Socio-Economic Indexes For Australia (SEIFA) [43] were categorized as schools in ‘higher socio-economic areas’, while those in the lower 50% were categorized as schools in ‘lower socio-economic areas’. School post-code areas were also used to categorize the school’s locality as either ‘rural’ (those schools in outer regional, remote and very remote areas) or ‘urban’ (those in regional cities and inner regional areas) based upon the Accessibility/Remoteness Index of Australia (ARIA) [44]. Reported barriers to the adoption of vegetable and fruit breaks were categorized by research staff. Barriers nominated by more than 5% of Principals are reported.

The prevalence of vegetable and fruit breaks within schools was calculated as the proportion of all Principals reporting that ‘all or some’ classes had such a break. Consistent with recommendations of the Commonwealth Government of Australia [30], and the criteria set by the Crunch&Sip® program materials [45], recommended program adoption by a school was defined as those having a daily vegetable and fruit break in 80% or more of classes and those which do not.

Logistic regression was performed to examine univariate associations between school characteristics (school type, school size, ARIA and SEIFA), program implementation strategies (written school
Table I. Associations between recommended vegetable and fruit break adoption and school characteristics and implementation strategies

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
<th>Recommended vegetable and fruit break adoption i.e. daily in 80% of classes</th>
<th>Unadjusted OR</th>
<th>Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% (95% CI)</td>
<td>(95% CI)</td>
<td>P-value</td>
</tr>
<tr>
<td>School characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>283 (73.7)</td>
<td>46.5 (39.8–51.4)</td>
<td>1.2 (0.7–1.9)</td>
<td>0.488</td>
</tr>
<tr>
<td>Non-government</td>
<td>101 (26.3)</td>
<td>41.6 (31.9–51.2)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>School size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>144 (37.5)</td>
<td>50.7 (42.5–58.9)</td>
<td>2.1 (1.1–4.0)</td>
<td>0.022^a</td>
</tr>
<tr>
<td>Medium</td>
<td>182 (47.4)</td>
<td>43.4 (36.2–50.6)</td>
<td>1.6 (0.8–2.9)</td>
<td>0.153</td>
</tr>
<tr>
<td>Large</td>
<td>58 (15.1)</td>
<td>32.8 (20.6–44.9)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ARIA remoteness index(^b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>94 (24.5)</td>
<td>57.5 (47.4–67.5)</td>
<td>2.0 (1.3–3.2)</td>
<td>0.004^a</td>
</tr>
<tr>
<td>Urban</td>
<td>289 (75.5)</td>
<td>40.1 (34.5–45.8)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SEIFA(^b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>221 (57.7)</td>
<td>50.7 (44.1–55.3)</td>
<td>1.8 (1.2–2.8)</td>
<td>0.004^a</td>
</tr>
<tr>
<td>High</td>
<td>162 (42.3)</td>
<td>35.8 (28.4–53.2)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Program implementation strategies(^c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written school policy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>223 (58.1)</td>
<td>48.4 (41.8–55.0)</td>
<td>1.5 (1.0–2.2)</td>
<td>0.071</td>
</tr>
<tr>
<td>No</td>
<td>161 (41.9)</td>
<td>39.0 (31.6–46.7)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Vegetable and fruit lesson plans used</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>335 (87.2)</td>
<td>46.0 (40.6–51.3)</td>
<td>1.6 (0.9–3.0)</td>
<td>0.141</td>
</tr>
<tr>
<td>No</td>
<td>49 (12.8)</td>
<td>34.7 (21.3–48.1)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Communicated with parents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>322 (83.9)</td>
<td>47.5 (42.0–53.0)</td>
<td>2.2 (1.2–4.0)</td>
<td>0.008^a</td>
</tr>
<tr>
<td>No</td>
<td>62 (16.1)</td>
<td>29.0 (17.7–40.0)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Teachers trained</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>116 (30.2)</td>
<td>60.3 (51.4–69.3)</td>
<td>2.5 (1.6–3.9)</td>
<td>&lt;0.001^a</td>
</tr>
<tr>
<td>No</td>
<td>268 (69.8)</td>
<td>37.7 (31.9–43.5)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

^aSignificant where \(\alpha = 0.05\).

^bSample size varies due to missing data (\(n = 383\)).

^cControlling for all school characteristics in multiple logistic regression.

Of the 479 randomly selected primary and central schools invited to participate in the survey, three

Results

Sample and school characteristics

Of the 479 randomly selected primary and central schools invited to participate in the survey, three
Vegetable and fruit breaks in Australian primary schools

6.3% were acting Principals and 6.0% had another role in the school. The mean length of time the Principals had been in their position at their school was 5.7 years (SD 4.3 years). Characteristics of participating schools are shown in Table I. Compared with non-participants, participants were significantly more likely to represent government and urban schools ($P < 0.05$).

### Attitudes to vegetable and fruit breaks

The proportions of Principals that either agreed or strongly agreed with each of the vegetable and fruit break statements are shown in Table II. The majority of Principals (99.5%) agreed or strongly agreed that it is part of a school’s role to provide an environment which encourages children to eat healthy foods.

### Barriers to vegetable and fruit breaks

Barriers to vegetable and fruit breaks as reported by Principals are identified in Table II. The most commonly reported barrier related to limited time in the curriculum with 41.1% of Principals referring to an already ‘crowded curriculum’.

### Prevalence and characteristics of school vegetable and fruit breaks

Two hundred and forty (62.5%) Principals reported that their school had vegetable and fruit breaks. Within these schools, 76.7% of Principals reported that vegetable and fruit breaks were present in all classes and 90.8% reported that they occurred each school day. Less than half (44.5%) of all 384 schools adopted a vegetable and fruit break to the recommended level (daily vegetable and fruit break in 80% or more of classes).

### Program implementation strategies

Table I shows the proportion of schools reporting program implementation strategies supportive of school vegetable and fruit breaks. While 87.2% reported having used lesson plans addressing vegetables, fruit or water consumption, only 30.2% reported having teachers trained in vegetable and fruit breaks.
Association between recommended vegetable and fruit break adoption and school characteristics and program implementation strategies

Univariate analyses found that the odds of having adopted a vegetable and fruit break to a recommended level was significantly greater among small schools, rural schools and schools from lower socio-economic areas (Table I). Univariate analyses also found that the odds of recommended vegetable and fruit break adoption were significantly greater for schools that communicated to parents about such programs occurring and those that had teachers trained in program implementation (Table I). Following multiple logistic regression analysis, and when controlling for school characteristics, parent communication and trained teachers remained significantly associated with recommended program adoption, with the odds of such adoption being 1.9 (95% confidence interval (CI) 1.0–3.6, \( P = 0.044 \)) times greater among schools who had communicated with parents and 2.2 (95% CI 1.4–3.6, \( P < 0.001 \)) times greater among schools with trained teaching staff than those without.

Discussion

This study is the first to describe the prevalence of vegetable and fruit breaks in Australian schools and the characteristics and implementation strategies associated with their adoption. Despite a reasonable overall prevalence (62%) and positive attitudes regarding breaks, less than half of schools had implemented the breaks to the recommended level. Such findings suggest that further initiatives are required to maximize the adoption of vegetable and fruit breaks in Australian schools if the public health benefit of such programs to young people are to be realized. Furthermore, the study identified that a number of organizational change strategies were associated with the adoption of vegetable and fruit break programs. While such findings provide important information to facilitate the adoption of vegetable and fruit programs in schools specifically, the results may also have implications for the adoption by schools of health promotion programs more broadly.

While lower than the adoption rate of the government-funded free vegetable and fruit distribution programs in the United Kingdom and United States [26, 46], the prevalence of schools in this study reporting the implementation of vegetable and fruit breaks (44.5%) was higher than that reported by other international subsidized school fruit and vegetable distribution programs (approximately 30%) [28, 29]. To our knowledge, the adoption of such a vegetable and fruit program in schools that requires parents to provide the vegetables and fruit for their child to consume at school has not been previously reported. Encouragingly, the results suggest that small schools and schools in rural or less socio-economically advantaged areas have the highest rates of program adoption. It could be reasoned, based upon social influence theory [34], that the smaller number of staff in small schools required to provide agreement to the implementation of a new program may account for this finding. Alternatively, the efforts of the school system or other government or non-government organizations to support schools implement a vegetable and fruit break may have been prioritized towards assisting schools with such characteristics. Even so, the study findings suggest that there is considerable scope for further improving the adoption of vegetable and fruit breaks across all schools in the state.

Parent communication and teacher training were the only implementation strategies independently associated with recommended vegetable and fruit break adoption highlighting the importance of parent engagement and staff education and skill development in successful program implementation [22]. Contrary to previous health promotion initiatives in schools, however, the existence of a supportive school policy or the use of lesson plans by teachers were not associated with vegetable and fruit breaks [22, 47] in the multivariate analyses. Nonetheless, encouraging a comprehensive implementation approach consisting of the development and implementation of school policies is likely to best facilitate the adoption and sustainability [22, 35]...
of vegetable and fruit programs and should be the focus of future interventions in schools.

While Principals were strongly supportive of vegetable and fruit breaks, increasing the number of Australian primary schools with a vegetable and fruit break will require strategies to overcome barriers to program adoption reported by Principals. In this study, Principals identified an already crowded curriculum, a perceived lack of support from parents for the program and limited availability or cost of vegetables and fruit as the primary factors which impede the implementation of vegetable and fruit break programs. The prevalence of school vegetable and fruit breaks found in this study, however, suggests that these barriers are not insurmountable. Supporting schools to identify ways as to how they can incorporate vegetable and fruit breaks into normal classroom routine such as reading or news time may assist teachers to integrate nutrition content into the curriculum. Implementing communication strategies such as newsletter articles and school orientation programs with parents specifically on the benefits of the program has been suggested to help boost parental support for health promotion programs in schools [33, 48]. Similarly, the use of consensus processes and securing the endorsement for program implementation by a credible opinion leader [35] may help secure the support of both parents and teachers for the initiative.

Anecdotally, to overcome the issues of vegetables and fruit perishing, cost or availability, a number of Principals reported allowing children to bring canned or dried fruits, asking local businesses to donate vegetables or fruit and cutting up and sharing the vegetables and fruit among all children (not just those who could afford to bring a piece of fruit or vegetable). Similarly, other Principals mentioned that they would utilize canteen staff to prepare foods and dispose of food scraps in school gardens to overcome the issue of mess in the classroom. Such innovative strategies by some schools represent local solutions to specific school level barriers to program adoption. Allowing flexibility in the implementation of programs and supporting school empowerment to meet the challenge of specific barriers to practice change may therefore represent an important strategy to facilitate the adoption health promotion programs by schools.

A number of methodological constraints require consideration when interpreting the study findings. Firstly, the study was conducted in one Australian state. The extent to which the findings can be generalized across other State and Territories school systems is therefore limited. The self-report nature of the study measures is subject to a number of biases including that arising from a perceived social desirable response which may have resulted in an overestimation of vegetable and fruit break adoption. While the extent to which this may have occurred is unknown, numerous international studies have used Principal self-report to evaluate school healthy eating policies and programs [49–51]. While we are unaware of any studies validating Principal report of school policies and practices, such studies in Children’s Services have found that authorized supervisors can validly and reliably report service policies and practices [52]. Notwithstanding these limitations, the study identifies the need for further support to schools to assist in the adoption of vegetable and fruit break programs and provides useful information for policy makers and practitioners to design and deliver such supportive initiatives.

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**Conflict of interest statement**

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