

# Assessment of the School Nutrition Environment

## A Study in Australian Primary School Canteens

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**Introduction:** Schools represent a valuable setting for interventions to improve children's diets, as they offer structured opportunities for ongoing intervention. Modifications to the school food environment can increase purchasing of healthier foods and improve children's diets. This study examines the availability of healthy food and drinks, implementation of pricing and promotion strategies in Australian primary school canteens, and whether these varied by school characteristics.

**Methods:** In 2012 and 2013, canteen managers of primary schools in the Hunter New England region of New South Wales reported via telephone interview the pricing and promotion strategies implemented in their canteens to encourage healthier food and drink purchases. A standardized audit of canteen menus was performed to assess the availability of healthy options. Data were analyzed in 2014.

**Results:** Overall, 203 (79%) canteen managers completed the telephone interview and 170 provided menus. Twenty-nine percent of schools had menus that primarily consisted of healthier food and drinks, and 11% did not sell unhealthy foods. Less than half reported including only healthy foods in meal deals (25%), labeling menus (43%), and having a comprehensive canteen policy (22%). A significantly larger proportion of schools in high socioeconomic areas (OR=3.0) and large schools (OR=4.4) had primarily healthy options on their menus. School size and being a Government school were significantly associated with implementation of some pricing and promotion strategies.

**Conclusions:** There is a need to monitor canteen environments to inform policy development and research. Future implementation research to improve the food environments of disadvantaged schools in particular is warranted.

(Am J Prev Med 2015;49(2):215–222) © 2015 American Journal of Preventive Medicine

### Introduction

**D**ietary risk factors, including low consumption of fruit and vegetables and high consumption of saturated fat, accounted for approximately 185 million deaths and 20 million disability-adjusted life years

globally in 2010.<sup>1</sup> Interventions to improve children's diets may be particularly effective in reducing the associated disease burden, as dietary habits formed in childhood persist into adulthood.<sup>2</sup> Assessments of childhood diets suggest that there is considerable scope to improve children's dietary intake. Data from the 2001–2004 National Health and Nutrition Examination Survey in the U.S. found that 78% and 96% of children aged 9–13 years consumed less than the recommended servings of fruit and vegetables, respectively.<sup>3</sup> In Australia, most recent population data (2011/2012), found that children aged 4–13 years consumed almost 40% of their daily recommended energy intake from energy-dense, high-fat, nutrient-poor foods, and less than 10% consumed adequate servings of vegetables.<sup>4</sup>

Schools are a promising setting to deliver interventions to improve children's diets,<sup>5</sup> as they provide unique

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0749-3797/\$36.00

<http://dx.doi.org/10.1016/j.amepre.2015.02.002>

opportunities to influence children's food choices during a crucial time in the development of eating behaviors.<sup>6</sup> Australian children consume approximately 40%<sup>7</sup> of their recommended energy intake during school hours and foods consumed at school are higher in fat, sugar, and energy than those typically consumed at home.<sup>8,9</sup> In Australia, school canteens sell foods and beverages to students during class break, instead of or in addition to foods brought from home. They are an integral part of the school nutrition environment and are accessed by 95% of primary school children.<sup>7,9</sup> Given this, ensuring that school canteens provide and promote healthy food options is important for improving child health and establishing healthy eating behaviors.

Evidence from systematic reviews, which mostly include studies conducted in the U.S., indicates that school-based strategies are effective in improving children's purchasing and dietary behavior. These reviews<sup>10–12</sup> found that increasing the availability of healthy options, restricting the sale of unhealthy foods, and competitively pricing healthy options increased children's fruit and vegetable consumption and reduced saturated fat intake at school. Furthermore, research in schools, colleges, and universities suggests that other modifications to the food environment may promote healthy eating.<sup>5,13,14</sup> For example, the promotion of healthier food options via menu labeling and the prominent display of healthy options in U.S. schools have been found to positively affect students' diets.<sup>15</sup>

Internationally, school food environments vary, with countries including the U.S., United Kingdom (UK), and France providing meals via school lunch programs,<sup>16</sup> and others including Australia, Canada,<sup>17</sup> New Zealand,<sup>18</sup> and the Netherlands<sup>19</sup> providing food and beverages over the counter from school shops or canteens. In the U.S., competitive foods (foods sold outside of school meals) are often also available via kiosks or stores located on campus.<sup>20</sup> As such, examining the practices implemented to improve student selection and consumption of healthier options is likely to provide useful comparison data to inform future obesity prevention initiatives in schools internationally.

Nevertheless, there have been few studies describing the extent to which school canteens implement pricing and promotion strategies to encourage purchasing of healthy foods and beverages. Previous studies of school food environments in Australia and the U.S. have focused on describing the availability of foods sold in canteens, provided by school lunch programs, or available via vending machines,<sup>21–23</sup> with limited information describing other practices. Although data from the 2012 U.S. School Health Policies and Practices Study indicate that approximately 47.1% of states provided support to

schools to implement pricing strategies and 30% provided support to prohibit advertising and promotion of unhealthy foods, the extent to which these strategies were implemented within schools is unknown.<sup>24</sup>

Therefore, this study was undertaken to describe the availability of healthy food and beverage options in Australian primary school canteens, as well as pricing and promotional practices used to encourage healthy food purchasing. Given the socioeconomic and geographic associations with child diet quality<sup>25,26</sup> and variation in school implementation of health promoting programs by size,<sup>27</sup> this study also assessed whether the nutrition practices of school canteens differed by school characteristics including SES, locality, size, and school type.

## Methods

### Ethics Approval

Ethics approval was provided by Hunter New England (HNE) Area Health Service Human Research Ethics Committee (HREC) (number 06/07/26/4.04); the University of Newcastle HREC (H-2008-0341); New South Wales (NSW) Department of Education and Communities (DEC); and relevant Catholic School Offices.

### Design and Setting

A cross-sectional survey was conducted with canteen managers from primary schools located in the HNE area of NSW, Australia, in 2012–2013. HNE covers a large non-metropolitan area (>130,000 km<sup>2</sup>) and consists of a demographically and socio-economically diverse population of approximately 112,000 children aged 5–14 years (13% of the state population of this age group).<sup>28</sup> Australian school canteens are managed at the school level by parent–teacher committees and principals, or leased to external providers.

### Study Sample

All schools within the HNE region were sampled from a database of Government and non-Government (Catholic and Independent) primary schools using information provided on the website of the NSW DEC,<sup>29</sup> the Catholic Education Commission,<sup>30</sup> and the Association of Independent schools.<sup>31</sup> All schools with a canteen were eligible to participate, other than special schools for students who are disabled, in juvenile justice, and hospitalized. Schools enrolling both primary and high schools students (i.e., central schools that cater to children aged 5–18 years) were excluded as school management structure and canteen operation for central schools are likely to differ from schools that cater solely for primary school-aged children.

### Data Collection Procedures

Principal's permission to contact canteen managers was sought during a school computer-assisted telephone interview (CATI) regarding their school's healthy eating and physical activity policies and practices. When permission was provided, an

information letter was sent to canteen managers inviting them to participate in the study. Two weeks following this, canteen managers were telephoned by a research assistant to confirm eligibility and consent to participate in a 20-minute CATI that examined the operational characteristics of the canteen, the canteen manager's knowledge of the healthy school canteen strategy, and pricing and promotion strategies implemented in their school. As there is no validated Australian tool examining the nutrition practices of school canteens, questions were developed by an advisory group consisting of canteen managers, teachers, representatives from the DEC and NSW Ministry of Health, dietitians, and behavioral scientists. The questions were piloted internally with health service staff. Selection of pricing and promotion strategies was based on evidence from systematic reviews indicating association of such outcomes with improved child purchasing and dietary behaviors.<sup>10,12,32</sup> Canteen managers were also asked to provide their menus and recipes used in food preparation. If a menu was not returned within 2 weeks, research staff searched school websites or contacted schools to obtain a copy of the menu. When a menu was obtained online, school staff members were contacted to confirm if the menu was current.

## Measures

Principals reported the number of students attending the school. School type (Government, non-Government [Catholic or Independent]) and postcode were obtained from school websites. Canteen managers reported the number of days per week that the canteen operated.

To determine the proportion of healthier and unhealthy foods provided by school canteens, two trained dietitians undertook menu audits using standardized procedures in accordance with the NSW Healthy School Canteen Strategy.<sup>33</sup> The menu audit process has been used in other studies.<sup>8,34,35</sup>

All NSW DEC schools are mandated to implement the strategy that uses a traffic light system to classify foods as green, amber, or red. Canteens cannot sell banned sugar-sweetened drinks (containing >300 kJ, 100 mg sodium/serving, or both) and must restrict the sale of "red" items to a maximum of twice per term. "Red" items are energy dense, low in nutrients, and high in saturated fat, salt, or sugar (e.g., deep-fried foods, confections, and chocolate-coated ice creams).

The policy also recommends that menus are filled with "green" foods, and that "amber" foods do not dominate the menu. "Green" foods are nutrient rich and contain only small amounts of saturated fat, salt, added sugar (e.g., fruit, vegetables, reduced-fat dairy foods, lean meats). "Amber" foods have some nutritional value and contain moderate amounts of saturated fat, salt, or added sugar (e.g., processed meats, sauces, full-fat dairy).

A ready reckoner or "occasional food criteria table" was used to classify foods according to the NSW Healthy School Canteen strategy.<sup>33</sup> To classify commercial products as "red" or "amber," the nutrition labels of these foods were compared to the occasional food criteria, which outlines a maximum value for saturated fat, sodium, and energy per serving (minimum fiber value is also required for cakes and sweet biscuits).<sup>33</sup> Canteen managers or food manufacturers were contacted to collect additional information regarding products and recipes. For items where insufficient information prohibited classification (e.g., "ambiguous products" such as homemade pizzas or commercial soups/pastas), a

consensus process was undertaken with a third dietitian to reach agreement on item classification. This occurred for approximately 5% of menu products. A high percentage of agreement (>90%) between two independent dietitian assessments of menus was achieved, in relation to the presence of healthier and unhealthy items.

For this study, "green" items were referred to as "healthier" foods and "red" and "banned" items were classified as "unhealthy" foods. The proportion of amber foods was not described in this study.

Canteen managers were asked if their school implemented the following pricing and promotion strategies<sup>10,32</sup>: (1) priced foods to encourage children's purchasing of healthy foods; (2) included only healthy foods in meal deals (which typically include a main meal item and for a small extra cost an additional drink/side/snack option); (3) positioned healthy foods, including fruit and vegetables, at children's eye level or on the counter; (4) labeled their canteen menu to identify healthier options; (5) reviewed their canteen menu to improve availability of healthy options; and (6) had a school canteen policy that specified the types of foods or drinks and promotion and pricing of products in canteens.

## Statistical Analysis

In 2014, all analyses were conducted using Stata, version 11. Descriptive statistics were generated for school characteristics and proportion implementing pricing and promotion strategies. The proportion of menus consisting of healthier and unhealthy options was also calculated. School postcodes were used to categorize schools into "higher socioeconomic areas" (those within the top 50%) and "lower socioeconomic areas" (those within the lower 50%) using the Socio-Economic Indexes For Australia (SEIFA) database.<sup>36</sup> The SEIFA is a measure of socioeconomic disadvantage of a geographic region that incorporates measures including education, occupation, income, and economic resources obtained from Australian census data.<sup>36</sup> School postcodes were also used to categorize schools as "rural" (outer regional, remote, and very remote areas) or "urban" (regional cities and inner regional areas) using the Accessibility/Remoteness Index of Australia (ARIA). To determine if there was a difference by school characteristics, the following independent variables were included in a logistic regression: SES (higher, lower); rurality (urban, rural); school size (small, [1–159 students], medium [160–450 students], large [>451 students]); and school type (Government, non-Government Catholic, non-Government Independent). The dependent variables were availability of healthy food (providing ≥50% healthier foods, providing no unhealthy food and drinks) and implementation of each of the examined practices.

## Results

Overall, 413 school principals were contacted; 340 (82%) completed the telephone interview; and 276 had a canteen. Of those with a canteen, 223 provided permission to contact the school canteen managers. Eighteen schools were excluded because they were central schools and provided food to high school students. Of these, 203 canteen managers (79% of schools with canteens)

completed the survey and a menu was obtained for 170 schools. Of those with a canteen, there were no significant differences in proportion of consenting and non-consenting schools located in high-socioeconomic (65% for consenters vs 66% for non-consenters,  $p=0.8853$ ) and urban areas (69% for consenters vs 60% for non-consenters,  $p=0.1133$ ).

The majority of schools were Government schools (77%), with an average number of 232 students (range, 10–735 students), 78% were located in lower socioeconomic areas, and 30% were located in outer regional/rural and remote areas.

Overall, 29% (95% CI=23%, 37%) of schools had a menu that primarily consisted ( $\geq 50\%$ ) of healthier foods, whereas 10% (95% CI=6.0%, 16%) had menus where  $<25\%$  of the items sold were classed as healthier foods. The mean percentage of healthier items listed on menus was 40% (SD=13%). Twenty-five percent (95% CI=19%, 33%) of schools sold banned drinks. Only 11% (95% CI=7.8%, 18%) of schools had menus that did not contain unhealthy foods. The mean percentage of unhealthy foods listed on menus was 7.7% (SD=7.1%).

Almost all (92%) canteen managers reported reviewing their menu annually to identify opportunities for improving the healthiness of items for sale, but less than half included only healthy foods in meal deals (25%) or labeled their menu to identify healthy options (43%), and only 22% had a comprehensive school canteen policy (Table 1).

A significantly larger proportion of schools located in high socioeconomic areas had primarily healthy options on their menus (OR=3.0) (Table 2). Large schools also (OR=4.4) had significantly higher odds of having primarily healthy menus. Non-Government schools had lower odds of positioning healthy foods at eye level (OR=0.3). Both large and medium schools had higher odds of positioning healthy foods at eye level or on the counter (medium, OR=4.0; large, OR=18), and medium schools had higher odds of having a canteen policy that encompasses pricing, promotion, and availability of healthy foods (OR=3.0) (Table 3).

## Discussion

To our knowledge, this study is the first to examine pricing and promotion strategies in Australian school canteens. Only 11% of schools did not sell unhealthy foods on their menus, whereas 25% included only healthy foods in meal deals and 43% labeled their menus to promote healthy options. There were variations in availability of healthy foods and implementation of pricing and promotion strategies by school characteristics. These findings suggest that there is considerable

scope to improve the availability of healthy foods and implementation of pricing and promotion strategies within schools.

Findings from this study regarding the availability of healthy foods relative to unhealthy foods are consistent with previous research. For example, in Australia, the U.S., and New Zealand, few schools are compliant with policies requiring the provision of healthy foods to children via kiosks, canteens, and food services, with research demonstrating excessive availability of sugar-sweetened beverages and high-energy, nutrient-poor snack foods via these services.<sup>8,18,37–40</sup>

A significantly smaller proportion of schools in disadvantaged areas reported having a menu that primarily consisted of healthier items. Such findings are concerning given that children located in disadvantaged areas are more likely to be obese.<sup>41</sup> Given the potential cost and waste associated with purchasing fresh fruit and vegetables,<sup>42,43</sup> such schools may limit their purchasing of these products to reduce costs. Support for disadvantaged schools should focus on strategies that schools could implement to reduce costs associated with providing healthy foods, increase profit, and minimize waste. Changing the management of canteen structures and provision of food from the school to a jurisdiction-wide level, such as that done in the U.S. and UK, could potentially reduce the cost of providing healthy foods for disadvantaged schools.<sup>44</sup>

Encouragingly, almost 80% of schools used pricing strategies to increase purchasing of healthy foods, and 70% positioned healthy items on the counter or at children's eye level. Marketing of healthy food options, such as including only healthy items in meal deals and menu

**Table 1.** Primary School Canteen Pricing and Promotion Strategies to Increase Purchase of Healthier Options ( $n=203$ )

Practices	n	% (95% CI)
Price food to encourage purchasing of healthier foods	160	79 (73, 84)
Include only healthy foods in meal deals	51	25 (19, 32)
Position healthy foods, including fruit and vegetables, at eye level or on the counter	141	70 (63, 76)
Label menu to identify healthy options	88	43 (36, 50)
Review menu to increase healthy options	186	92 (87, 95)
Has a school canteen policy that addresses foods sold in the canteen and promotion and pricing policies	44	22 (16, 28)



**Table 2.** Availability of Healthy Food Options by Rurality, SES, School Size, and School Type (n=170)

	50% or more of foods sold on menus were healthy foods <sup>a</sup>		No unhealthy foods on menus <sup>a</sup>	
	% Yes	OR (95% CI)	% Yes	OR (95% CI)
Rurality				
Urban	29	1.0	12	1.0
Rural	29	1.4 (0.6, 3.1)	6.3	0.4 (0.1, 1.5)
SES				
Low	24	1.0	11	1.0
High	46	<b>3.0 (1.4, 7.6)**</b>	9.8	0.8 (0.2, 2.8)
School size				
Small	19	1.0	16	1.0
Medium	30	2.1 (0.9, 4.6)	7.3	0.4 (0.1, 1.1)
Large	55	<b>4.4 (1.5, 13)*</b>	5.0	0.2 (0.03, 2.0)
School type				
Government	31	1	12	1
Non-Government	16	0.6 (0.2, 1.6)	3.5	0.3 (0.03, 2.2)

Note: Boldface indicates statistical significance (\* $p < 0.05$ ; \*\* $p < 0.01$ ).

<sup>a</sup>Criteria consistent with recommendations from the NSW Healthy Canteen Policy.

labeling, was implemented by less than half of schools. As these strategies may be particularly effective in influencing children's purchasing decisions,<sup>14</sup> interventions to increase the use of these strategies are warranted. Larger schools and Government schools had higher odds of placing healthy food options at eye level and having a comprehensive school canteen policy. Larger schools may have more resources and thus a greater capacity to implement healthy canteen initiatives. The introductions of the mandatory healthy canteen strategy in 2005 may have also affected canteen practices in Government schools.

## Limitations

Some limitations need to be considered when interpreting these findings. Although 67% of schools provided menus for assessment, our results may overestimate the proportion of schools that have primarily healthy menus, given that foods sold may differ between schools that did and did not provide a menu. The study was conducted in one state; thus, the extent to which the results are generalizable to other states may be limited. The measures related to canteen practices have not been validated and may be subject to perceived socially desirable responses. Though the extent to which overreporting may have occurred is unknown, previous studies in schools have found moderate to high agreement between staff reporting of practices compared to

observational data.<sup>45</sup> This study used the NSW Healthy School canteen strategy to classify "healthier" and "unhealthy" foods.<sup>46</sup> This could have resulted in some foods containing relatively high amounts of saturated fat or sodium per 100g being categorized as amber instead of red (unhealthy) through reduction of serving sizes.<sup>46</sup>

## Conclusions

Notwithstanding these limitations, this study highlights the need to continue to monitor school canteen nutrition environments to inform policy development and intervention research. Findings

from this study suggest that without active implementation support, schools have limited capacity to implement healthy canteen policies as intended. Governments play a key role in ensuring that sufficient resources and ongoing implementation support is provided when introducing such policies to schools. Further, efforts to monitor and enforce implementation of such guidelines may be needed. Numerous barriers to implementing healthy canteen policies and practices within schools, including potential cost implications and a lack of time, knowledge, and skills, have been previously identified.<sup>27,48,49</sup> Implementation frameworks suggest that the engagement of key stakeholders (including principals, canteen managers, and students); goal setting and monitoring; performance feedback; provision of training and resources; and persuasive communication regarding benefits of implementing such strategies may be useful to support schools in overcoming these barriers.<sup>47,48,50</sup> Research assessing the impact of such multistrategy implementation interventions targeting barriers to policy implementation is currently underway.<sup>34</sup> If shown to be effective, research examining the usefulness of such interventions in supporting disadvantaged schools in providing healthier foods should be undertaken to reduce the socioeconomic disparities identified in this study.

**Table 3.** Implementation of Pricing and Promotion Practices by Rurality, SES, School Sizes, and Types (n=200)

	Price food to encourage purchasing of healthier foods		Include only healthy foods in meal deals		Position healthy foods, including fruit and vegetables, at eye level or on counter		Label menus to identify healthy options		Review menu to increase healthy options		Has a comprehensive school canteen policy	
	% Yes	OR (95% CI)	% Yes	OR (95% CI)	% Yes	OR (95% CI)	% Yes	OR (95% CI)	% Yes	OR (95% CI)	% Yes	OR (95% CI)
Rurality												
Urban	78	1.0	26	1.0	72	1.0	45	1.0	92	1.0	20	1.0
Rural	81	1.3 (0.6, 3.0)	22	0.7 (0.2, 1.2)	63	0.9 (0.4, 1.8)	38	0.8 (0.4, 1.5)	90	1.3 (0.4, 4.2)	24	1.7 (0.8, 3.9)
SES												
Low	78	1.0	27	1.0	70	1.0	42	1.0	91	1.0	20	1.0
High	81	1.1 (0.4, 2.6)	17	0.6 (0.3, 1.5)	70	0.8 (0.4, 1.8)	47	1.2 (0.6, 2.3)	93	0.7 (0.2, 2.0)	23	1.3 (0.6, 3.0)
School size												
Small	73	1.0	24	1.0	51	1.0	41	1.0	91	1.0	13	1.0
Medium	82	1.8 (0.9, 3.8)	26	1.1 (0.6, 2.3)	80	<b>4.0 (2.0, 8.2)**</b>	46	1.1 (0.6, 2.1)	90	1.1 (0.4, 3.0)	27	<b>3.0 (1.3, 6.8)*</b>
Large	91	3.5 (0.8, 17)	27	1.4 (0.5, 4.3)	95	<b>18 (2.3, 141)**</b>	41	0.9 (0.3, 2.4)	99	3.9 (0.5, 33)	27	2.2 (0.7, 6.8)
School type												
Government	81	1.0	25	1.0	74	1.0	44	1.0	92	1.0	25	1.0
Non-Government	72	0.6 (0.3, 1.4)	26	1.1 (0.5, 2.5)	51	<b>0.3 (0.2, 0.7)**</b>	41	0.9 (0.4, 1.8)	90	0.9 (0.3, 2.8)	5	<b>0.1 (0.03, 0.7)*</b>

Note: Boldface indicates statistical significance (\* $p < 0.05$ ; \*\* $p < 0.01$ ).

The authors wish to acknowledge the computer-assisted telephone interviewers, school principals, and canteen managers for their contribution to the study. The authors wish to acknowledge Renee Reynolds, Amanda Williams, Melanie Sharpe, and Kirsty Seward for their assistance undertaking menu audits.

No financial disclosures were reported by the authors of this paper.

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