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1 **Title:**

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3 Evaluation of implementation of a healthy food and drink supply strategy throughout
4 the whole school environment in Queensland state schools, Australia.

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7 **Running title:**

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9 Evaluation of a food supply strategy in Queensland schools.

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48

49 **ABSTRACT**

50

51 **Background/Objectives:** This paper reports on the evaluation of the Smart Choices
52 healthy food and drink supply strategy for Queensland schools (Smart Choices)
53 implementation across the whole school environment in state government primary and
54 secondary schools in Queensland, Australia.

55 **Subjects/Methods:** Three concurrent surveys using different methods for each group
56 of stakeholders which targeted all 1275 school Principals, all 1258 Parent and Citizens'
57 Associations (P&Cs) and a random sample of 526 tuckshop convenors throughout
58 Queensland. 973 Principals, 598 P&Cs and 513 tuckshop convenors participated with
59 response rates of 78%, 48%, and 98% respectively.

60 **Results:** Nearly all Principals (97%), P&Cs (99%) and tuckshop convenors (97%)
61 reported that their school tuckshop had implemented Smart Choices. The majority of
62 Principals and P&Cs reported implementation respectively in: school breakfast
63 programs (98% and 92%); vending machine stock (94% and 83%); vending machine
64 advertising (85% and 84%); school events (87% and 88%); school sporting events
65 (81% and 80%); sponsorship and advertising (93% and 84%); fundraising events (80%
66 and 84%); and sporting clubs (73% and 75%). Implementation in curriculum activities,
67 classroom rewards and class parties was reported respectively by 97%, 86% and 75%
68 of Principals. Respondents also reported very high levels of understanding of Smart
69 Choices and engagement of the school community.

70 **Conclusions:** The results demonstrated that food supply interventions to promote
71 nutrition across all domains of the school environment can be implemented
72 successfully.

73 **Key words:** schools; food supply; environment; evaluation; Australia; obesity.

74

75 **INTRODUCTION**

76

77 Children and young people need optimum nutrition to enhance immunity, achieve full
78 cognitive and physical potential, maintain healthy weight, establish healthy dietary
79 patterns and reduce future risk of chronic disease (1). Further there is evidence that
80 good nutrition can impact positively on performance at school (2, 3). However, dietary
81 intakes of Queensland children aged 5-17 years are high in added sugars and saturated
82 fat, low in fruit and vegetables, and particularly for older girls, low in calcium and iron
83 (4). In 2006, 19.4% of boys and 22.8% of girls of these ages were overweight or obese
84 (4).

85

86 The school setting in Australia provides opportunity to implement ‘upstream’ nutrition
87 programs (5, 6) as around 37% of children’s energy intake is consumed at school on
88 school days (7). However, energy-dense nutrient-poor (EDNP) food and drinks are
89 over-represented in the school environment (8). In one Australian study only about
90 10% of children used the school canteen, but they consumed more energy from EDNP
91 foods than children who brought lunch from home (8). Provision of EDNP foods at
92 school may contribute to children’s belief that daily consumption of these products is
93 appropriate (9). Conversely, the school food supply can potentially reinforce nutrition
94 education components of the school curriculum (10, 11) and environmental
95 interventions in schools can assist parents in improving children’s diet at home (12). In
96 Queensland and internationally, the school setting is identified as one important area
97 for intervention to promote healthy weight in children (1, 5, 13).

98

99 In 2007, there were 1,715 schools in Queensland, of which 72.9% (1,250) were state
100 (government) schools and 27.1% (465) were non-state (non-government) schools (14).
101 There were 697,903 full-time students, of which 68.6% attended state schools and
102 31.4% attended non-state schools (14). The school year in Australia is divided into four
103 terms.

104

105 Schools in Queensland are supported by a Parents and Citizens' Association (P&C)
106 which provides feedback on school policies and activities, resources to assist student
107 learning and opportunities for parent involvement in children's education (15). The
108 P&C usually operates the school tuckshop (or canteen) to provide a student foodservice
109 and potentially raise supplementary funds. School tuckshops sell ready-to-eat items to
110 take-away and do not provide cooked meals for consumption in dining facilities.

111

112 The Smart Choices healthy food and drink supply strategy for Queensland Schools
113 (Smart Choices) (16) was developed by a partnership between the Department of
114 Education and Training (DET) and Queensland Health, and implemented with the
115 support of professional, and non-government organisations. The strategy aims to ensure
116 that all food and drinks supplied in schools reflects the Dietary Guidelines for Children
117 and Adolescents in Australia (17) and targets the school community and whole school
118 environment according to evidence described previously (18-20).

119

120 Smart Choices is based on an approach developed in New South Wales (21) to separate
121 foods and drinks into three categories: 'green' (have plenty); 'amber' (select carefully);
122 and 'red' (occasional). Foods and drinks from the five basic food groups are classified
123 in the 'green' category. The amounts of energy, saturated fat, sodium and fibre in other

124 foods are assessed to determine if they fit into the ‘amber’ or ‘red’ categories. Smart
125 Choices ensures that ‘red’ foods and drinks are eliminated from schools’ regular food
126 supply, and are supplied on no more than two occasions each term, such as celebrations
127 or fundraising events. More information about Smart Choices is available elsewhere
128 (16).

129

130 Smart Choices applies to all situations where food and drinks are supplied in the school
131 environment – tuckshops, vending machines, school excursions, school camps,
132 fundraising, classroom rewards, sports days, breakfast programs, school events, class
133 parties, sponsorship and advertising and curriculum activities. Implementation became
134 mandatory in all 1275 Queensland state schools on 1st January 2007. Mandatory
135 implementation was not possible in non-state schools as they are not administered by
136 the state government.

137

138 The purpose of this paper is to report on an evaluation of the implementation of Smart
139 Choices in all state schools in Queensland after implementation had been mandatory
140 for one term.

141

142 **METHODS**

143

144 **Sample Selection and Data Collection**

145 Three surveys of school Principals, P&Cs and tuckshop convenors were conducted in
146 Queensland state primary and secondary schools during Term 2 (May-July) 2007 to
147 examine the process and impact of implementation of Smart Choices. All Principals
148 with an email address provided by DET (n=1275), all P&Cs (n=1258) and tuckshop

149 convenors from all state schools with an operating tuckshop (n=905) who had held the
150 position for at least 12 months were eligible for inclusion. Non-state schools were not
151 included and schools catering for children with special needs (special schools) were
152 excluded from the tuckshop convenor survey, as few have tuckshops.

153

154 All eligible school Principals were invited to complete an online survey. More
155 Principals were eligible than the number of state schools in Queensland as some
156 schools have multiple campuses. A self-administered questionnaire was posted to each
157 P&C with a reminder sent four weeks later to all non-responders. To manage costs, a
158 random sample of tuckshop convenors was interviewed using a Computer Assisted
159 Telephone Interview. Different methods utilising the most effective communication
160 channels were applied to maximise the response rate from each group.

161

162 Surveys were completed by 991 Principals, 607 P&Cs and 513 tuckshop convenors.
163 Responses missing more than 25% of the survey items were withdrawn from further
164 analyses. The final sample size comprised 973 Principals, 598 P&Cs and 513 tuckshop
165 convenors with response rates of 78%, 48%, and 98% respectively.

166

167 **Data Analysis**

168 Results were analysed by school location (rural or urban) and school type (primary,
169 secondary or special school). Schools with preparatory year (PY) to year 9 were coded as
170 primary. Schools with years 8 to 12, or PY to years 10-12 were coded as secondary
171 schools.

172

173 Results were analysed using SPSS 13.0 (SPSS Inc, Chicago, IL). ANOVA tests were
174 used to identify difference between groups; $p < 0.05$ was used to conclude a significant
175 difference between groups.

176

177 **RESULTS**

178

179 Details of the survey sample are presented in Table 1. (INSERT TABLE ONE NEAR
180 HERE) The sample was representative of Queensland state schools by location and
181 type of school.

182

183 **Implementation**

184 Almost all Principals (96-98%) reported implementation of Smart Choices in school
185 tuckshops, breakfast programs, and curriculum activities (Figure 1) (INSERT FIGURE
186 1 NEAR HERE). Most Principals also reported that vending machine advertising and
187 stock, school excursions, sponsorship and advertising, foods prepared and sold or
188 supplied by students, school camps, school events, and student rewards met the
189 requirements of Smart Choices. Although still high, fewer Principals reported
190 implementation of Smart Choices in school sporting clubs, class parties, fundraising
191 activities, and school sporting events. Overall 83% of Principals rated their schools as
192 achieving good or excellent implementation, and only 8% of Principals rated
193 implementation as fair, poor or unsure.

194

195 Ninety-nine percent of P&Cs reported implementing Smart Choices in the school
196 tuckshop and 92% in breakfast programs (Figure 1). Although still very high, fewer

197 P&Cs reported implementation in school/P&C events, fundraising, sponsorship and
198 advertising, vending machines, sports events and school sporting clubs.

199

200 Ninety-seven percent of tuckshop convenors reported that all ‘red’ foods and drinks
201 had been removed from the tuckshop. Ninety-one percent of tuckshop convenors
202 reported that the availability of ‘green’ foods and drinks had increased on the tuckshop
203 menu, particularly low fat dairy products (90%), plain water (82%), fruit (78%),
204 vegetables (77%) and wholegrain foods (75%). Fifty-six percent of P&Cs reported
205 increased (15%) or unchanged (41%) tuckshop profits since implementing Smart
206 Choices. Around one-third (32%) reported decreased profits, and the remaining 13%
207 were unsure whether there had been any change.

208

209 **Understanding**

210 Seventy-nine percent of Principals, 86% P&Cs and 89% of tuckshop convenors rated
211 their understanding of Smart Choices as good or excellent. Fifty-three percent of P&Cs
212 and 70% of tuckshop convenors attended at least one information session.

213

214 At least 95% of P&Cs and tuckshop convenors were confident classifying food and
215 drinks as ‘green’, ‘amber’ or ‘red’, and 99% of tuckshop convenors were confident
216 implementing Smart Choices.

217

218 **Engagement**

219 Ninety-seven percent of Principals and 93% of P&Cs reported that arrangements to
220 limit the supply or sale of ‘red’ foods and drinks to no more than two occasions per
221 term existed.

222

223 Ninety-one percent of Principals and 86% of P&Cs agreed that Smart Choices was an
224 important strategy to improve children's health; 90% and 91% agreed that the school
225 put student's health and wellbeing before profits; and 64% and 58% agreed that the
226 school received a lot of support from the school community. Amongst P&Cs, 78%
227 believed that healthy school tuckshops could be financially viable and 62% believed
228 healthy fundraising could be financially viable.

229

230 **Differences between type of schools and location of schools**

231 Urban school Principals were more likely than rural school Principals to report
232 implementation at sporting events, and to rate overall implementation as good or
233 excellent (87% and 79%, $p \leq 0.001$) (Table 2). (INSERT TABLE 2 NEAR HERE)
234 Primary school Principals were more likely than secondary school Principals to report
235 implementation in curriculum activities (98% and 95%, $p \leq 0.05$) and school excursions
236 (95% and 91%, $p \leq 0.05$).

237

238 Urban school P&Cs were significantly more likely than rural school P&Cs to report
239 increased tuckshop profits (19% and 10%, $p \leq 0.01$). There was no significant difference
240 in reporting increased tuckshop profits between secondary and primary schools (17%
241 and 11%, ns) but secondary school P&Cs were significantly more likely than primary
242 schools to report decreased tuckshop profits (47% and 26%, $p \leq 0.01$).

243

244 Urban school tuckshop convenors were significantly more likely than those from rural
245 schools to agree or strongly agree that they had reliable access to healthier products
246 (86% and 69%, $p \leq 0.001$) and to report increased availability on their menus of fruit

247 (86% and 69%, $p \leq 0.001$) reduced fat dairy products (93% and 87%, $p \leq 0.05$)
248 wholegrain products (83% and 66%, $p \leq 0.001$) and chilled water (89% and 74%,
249 $p \leq 0.001$).

250

251 Primary school tuckshop convenors were significantly more likely to agree or strongly
252 agree than those from secondary schools that they were satisfied with the range of
253 'green' and 'amber' products available (82% and 70%, $p \leq 0.01$) and to report increased
254 availability of fruit on their menus (83% and 67%, $p \leq 0.01$).

255

256 Principals from secondary schools were more likely than those from primary schools
257 (85% and 77%, $p \leq 0.05$), and those from urban schools were more likely than those
258 from rural schools (83% and 75%, $p \leq 0.05$), to report their understanding of Smart
259 Choices as either good or excellent.

260

261 Urban P&Cs were more likely than rural P&Cs to attend a Smart Choices information
262 session (43% and 30%, $p \leq 0.01$) and twice as likely to contact support organisations for
263 assistance. Urban tuckshop convenors were also more likely than rural convenors to
264 attend an information session (52% and 37%, $p \leq 0.001$) or a convenor network meeting
265 (43% and 20%, $p \leq 0.001$). Secondary school convenors were significantly more likely
266 than primary school convenors to report attending all opportunities for training and
267 networking.

268

269 **DISCUSSION**

270

271 **Comparison with other school-based nutrition intervention projects**

272 Internationally, nutrition interventions in schools have focused on nutrition education
273 programs (13, 22, 23) while more ‘upstream’ environmental interventions have largely
274 focused on school lunches, school canteens (24-26), vending machines (27), or specific
275 practices such as breakfast programs (28, 29) and school gardens (30). Interventions
276 tend to focus on specific foods (26), including fruit and vegetables (12, 31, 32), or
277 specific dietary outcomes, such as increased consumption of low fat choices (33).
278 Compensation may occur if all foods and drinks and school environments are not
279 targeted. For example, vending machine numbers doubled and vending sales of chips
280 and candy increased when nutrition policies were implemented in school lunch
281 services in Texas (34). When the nutrition policy was extended across other school
282 food environments, the number of vending machines reduced to near baseline levels
283 (25). Most relevant previous studies have been conducted in small numbers of schools
284 to suit study design and foster randomization and comparison of intervention effects
285 (35).

286

287 In other Australian states, healthy food and drink supply initiatives have focused on
288 school canteens and tuckshops (20, 36). Poor outcomes were described in one state, but
289 the reported results included non-government schools (where the guidelines were not
290 mandatory), some data were collected before the guidelines became mandatory, and it
291 was unknown if school menus had improved over time (37). Internationally, some
292 school-based interventions to increase the availability and promotion of specific foods
293 have been successful (33), particularly when extended beyond the school cafeteria (38).
294 A potentially useful framework for classification of environmental policies to promote
295 school nutrition has been developed recently in Canada (39). However, to our
296 knowledge Smart Choices is the first time that a healthy food and drink supply policy

297 has been implemented successfully across most aspects of the whole school
298 environment, particularly in such a large number of schools.

299

300 **Implementation**

301 All key members of the school community contributed to implementing Smart Choices
302 across the school environment. High levels of implementation were reported in
303 tuckshops, and were slightly higher than results from other Australian states (20, 36,
304 37). Greater focus and implementation support are required across sporting events and
305 clubs, fundraising, school events, class parties and student rewards.

306

307 Despite higher rates of attendance at information sessions, secondary schools reported
308 more challenges implementing Smart Choices in tuckshops, and were less likely to
309 report increasing profits and satisfaction with the range of healthy products available.
310 The greater variety and number of products offered at secondary schools, and
311 observations of more established food preferences of older children (4) may help
312 explain these results. Challenges with comprehensive implementation of nutrition
313 policies in secondary schools compared to primary schools is consistent with
314 international experience (40, 41).

315

316 Other reported differences in implementation may be explained by different levels of
317 interest and abilities amongst individuals responsible for implementing changes and
318 different levels of support available from external agencies.

319

320 Fundraising activities based on 'red' foods and drinks, such as chocolate drives, have
321 high profit generating potential. Therefore, it is encouraging that 80% of Principals and

322 84% of P&Cs reported implementing Smart Choices in this area. However, with one in
323 five schools not implementing Smart Choices in fundraising, and fewer P&Cs
324 believing that healthy fundraising can be financially viable (compared to a healthy
325 tuckshop), strategies to improve P&Cs' confidence and ability to fundraise successfully
326 without relying on 'red' products are needed to build on existing work (42).

327

328 Urban schools faced fewer barriers to implementing Smart Choices, and had greater
329 access to healthy foods through suppliers and distributors. The higher prices and
330 limited availability of healthy foods in rural and remote communities throughout
331 Queensland has been documented previously (43); policy initiatives beyond the school
332 environment are required urgently to address these issues. However, Principals and
333 P&Cs from rural and remote schools were also less likely to report positive attitudes
334 towards the implementation of Smart Choices. These results suggest that additional
335 support for implementation should be directed to rural schools.

336

337 The Queensland Association of School Tuckshops (QAST) estimated that the total
338 sales figure for school tuckshops in Queensland exceeded \$154 million per annum in
339 2007 (44). The greater range of 'healthy' products available since the introduction of
340 Smart Choices suggests that this purchasing power has influenced product
341 development and reformulation, such as reduced sugar, salt and fat versions of
342 processed savoury foods and dairy foods, and smaller sized bakery products.

343

344 Recent evidence suggests that most schools do not encounter overall losses of revenue
345 after making improvements to nutrition policies (41). The changes in reported tuckshop
346 profits were not investigated at the time as implementation had been mandatory for

347 only one school term prior to evaluation. Despite 32% indicating profits had decreased,
348 a 2008 survey reported that 83% of school tuckshops were profitable, with only 17%
349 reporting any level of loss (44). Only half of the tuckshops stated that making a profit
350 was important which could explain why some continue to make a loss. Further work is
351 needed to more thoroughly assess the financial impact of policy changes by
352 quantifying revenue and profit and losses (41).

353

354 **Engagement**

355 Schools clearly support the rationale for Smart Choices with most respondents
356 believing they have a role in promoting the health and wellbeing of students. This was
357 reinforced by the high level of support from Principals and P&Cs for the importance of
358 Smart Choices as a strategy to improve children's health, and in putting student health
359 and wellbeing before profits. The lower levels of involvement of the broader school
360 community may reflect the challenges of engaging community volunteers in general
361 school activities (45).

362

363 The vast majority of Principals and P&Cs reported that arrangements were in place to
364 limit the supply or sale of 'red' foods and drinks across the school to no more than two
365 occasions a term (97% and 93% respectively), indicating a high level of engagement
366 and coordination across schools. This was very encouraging, given another Australian
367 study suggested that teachers are less likely than others to see obesity prevention as a
368 responsibility of schools (46).

369

370 **Limitations**

371 While the response rates of the online and mail out surveys are typical, (47, 48)
372 caution must be taken in generalising results to all state schools across Queensland, as
373 it is not known if survey respondents differed from schools who did not respond. For
374 example, comparison of P&C responses with non-responders (Table 1) suggest that
375 rural primary schools and special schools were slightly under-represented, potentially
376 skewing reported implementation in favour of urban schools.

377

378 The results of all three surveys were based on self-report, which is clearly not as
379 objective as recorded observations. However, the very high level of consistency
380 between the three groups adds credibility to the self-reported results in this study, and
381 Principals were ideally positioned to report on activities within their school and the
382 attitudes of those implementing the strategy.

383

384 The unavailability of baseline data to compare quantitative changes in food supply is a
385 major limitation. Assessing the impact of school nutrition policy using the most robust
386 forms of evaluation would ideally require social policy to be applied so that
387 evaluations could be constructed as experiments (29). However, this can be difficult
388 when the perceived value of implementing an intervention rapidly (and widely) is high.
389 This evaluation focused on process and impact of Smart Choices implementation;
390 further work to evaluate outcomes by assessing turnover of foods and drinks through
391 tuckshops is desirable (26)

392

393 **CONCLUSION**

394

395 The evaluation has demonstrated that broad environmental interventions to promote
396 healthy eating across all domains of the school setting can overcome recognized
397 barriers (49) and be implemented successfully. Future program resources should
398 provide ongoing support to maintain implementation in tuckshops, vending machines
399 and breakfast programs and strengthen implementation in school sporting events and
400 clubs, fundraising events, classroom rewards and class parties.

401

402 **CONFLICT OF INTEREST**

403

404 The authors declare no conflict of interest.

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Table 1. Survey Sample.

	Principals (n= 1,275)		P&Cs (n=1,258)		Tuckshops (n=530)	Convenors
	Responding to survey (n=973) n (%)	Total Proportion (%)	Responding to survey (n=598) n (%)	Total Proportion (%)	Responding to survey (n=513) n (%)	Total Proportion (%)
Region						
Rural	494 (51%)	52	275 (46%)	52	243 (47%)	48
Urban	479 (49%)	48	323 (54%)	48	270 (53%)	52
School Type						
Primary	728 (75%)	75	433 (72%)	75	341 (77%)	76
Secondary	209 (21%)	21	150 (25%)	21	172 (23%)	24
Special School	36 (4%)	4	15 (3%)	4	n/a	n/a
Rural Schools						
Primary	389 (40%)	41	208 (35%)	41	157 (31%)	36
Secondary	103 (11%)	11	66 (11%)	11	86 (17%)	12
Special School	2 (0.2%)	0.5	1 (0.2%)	0.4	n/a	n/a
Urban Schools						
Primary	339 (35%)	34	225 (38%)	35	184 (36%)	40
Secondary	106 (11%)	10	84 (14%)	10	86 (17%)	12
Special School	34 (4%)	3.5	14 (2%)	3	n/a	n/a

Table 2. Reported implementation of Smart Choices by school Principals and Parents and Citizens' Associations (P&Cs).

School Food Supply Area	Primary schools % (Total n)	Secondary schools % (Total n)	Urban schools % (Total n)	Rural schools % (Total n)
Tuckshops				
-P&Cs	99% (387)	99% (147)	99% (312)	99% (235)
-Principals	97% (630)	98% (204)	99% (454)	96% (399)
Curriculum activities[^]				
-Principals	98%* (612)	95%*(180)	96% (411)	94% (412)
Classroom rewards[^]				
-Principals	86% (695)	88% (207)	87% (471)	84% (466)
School excursions[^]				
-Principals	95%* (31)	91%* (17)	94% (435)	93% (452)
Fundraising events				
-P&Cs	87%* (419)	79%* (135)	86% (302)	82% (262)
-Principals	79% (680)	83% (194)	82% (444)	78% (461)
Sporting events				
-P&Cs	88% (400)	84% (146)	89% (295)	84% (259)
-Principals	82% (673)	79% (202)	86% [#] (443)	77% [#] (453)
School events other than sporting				
- P&Cs	87% (421)	92% (144)	86% (305)	82% (262)
- Principals	86% (694)	88% (204)	88% (466)	86% (461)
Sporting clubs				
-P&Cs	79% (228)	70% (84)	79% (183)	74% (133)
-Principals	74% (263)	70% (90)	74% (180)	73% (176)
School camps[^]				
-Principals	92% (681)	90% (198)	91% (455)	91% (455)
Vending machine stock				
-P&Cs (P&C operated)	64%* (11)	92%*(25)	85% (26)	80% (10)
-Principals	91% (11)	97% (38)	97% (36)	86% (14)
Vending machine advertising				
- P&Cs (P&C operated)	60%* (10)	95%* (21)	86% (22)	78% (9)
- Principals	89% (9)	87% (38)	89% (35)	77% (13)
Class parties				

-Principals	74% (664)	79% (176)	77% (446)	72% (427)
Breakfast programs				
-P&Cs	92% (145)	91% (92)	93% (175)	91% (64)
-Principals	99% (205)	96% (144)	98% (233)	98% (133)
Sponsorship and advertising				
-P&Cs	84% (205)	86% (11)	86% (186)	82% (99)
-Principals	92% (296)	95% (121)	93% (261)	92% (165)
'red' occasions limited to 2 per term				
-Principals^	97% (695)	99% (207)	99% (470)	95% (489)

Significance * ≤ 0.05 # ≤ 0.001

^ Only school Principals were asked about implementation in these areas of school food supply.

Figure 1. Proportion of Principals and P&Cs reporting implementation.

