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BRIEF REPORT

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Feasibility and principal acceptability of school-based mobile communication applications to disseminate healthy lunchbox messages to parents

Abstract

Issue addressed: This study aimed to assess the feasibility and acceptability of using an existing school-based mobile communication application to deliver messages to parents on how to pack a healthy lunchbox.

Methods: A telephone survey was conducted with 196 primary school principals within the Hunter New England region of New South Wales, Australia, in 2016.

Results: Almost two thirds of primary schools (59%) currently use a school-based mobile communication application to communicate with parents. Most principals (91%) agreed school lunchboxes need improving, of which 80% agree it is a school's role to provide information and guidelines to parents. However, only 50% of principals reported currently providing such information. The provision of lunchbox messages to parents by a third party appeared an acceptable model of delivery by principals. Larger schools and schools in urban and lower socio-economic localities were more likely to have used a school-based mobile communication application.

Conclusion: The majority of principals recognise student lunchboxes need improving. The use of school-based mobile communication applications appears to be feasible and acceptable by principals as a method of communicating lunchbox messages to parents.

So what? Use of school-based mobile communication applications may be an effective method for delivering health information at a population level. Future research should assess the potential efficacy of disseminating health interventions via this modality.

1 | INTRODUCTION

Child and adolescent overweight and obesity remain a priority health issue internationally and in Australia.[1] Dietary patterns including low fruit and vegetable intake and excessive consumption of energy-dense foods that offer little nutritional value (discretionary foods) are among the primary drivers of unhealthy weight gain.[2,3] As such, the World Health Organisation (WHO) recommends schools implement strategies to improve public health nutrition.[4]

In Australia, a number of strategies have been implemented to improve food sold to children through school canteens. However, previous research from 2004 demonstrated that most foods consumed by Australian children at school are brought from home in a lunchbox.[5] The average lunchbox of an Australian student contains food and beverages totalling over 3000 kJ (approximately 30%-50% of children aged 5-12 years recommended daily energy intake)[6] and includes greater than three serves of discretionary foods.[7,8] Interventions aimed at improving the nutritional quality of foods packed for children therefore represent a particularly promising strategy to improve child nutrition and reduce the risk of unhealthy weight gain.

Electronic communication platforms are available to schools to enable dissemination of information directly to parents about student or school activities via smartphone applications ("apps"). These platforms represent a potentially innovative way of delivering parents nutritional support to encourage the packing of healthy lunchboxes. Such an approach may overcome many of the barriers parents report to engaging in other school-based child nutrition interventions including travel requirements and time constraints.[9,10] App-based interventions are also able to deliver interventions with fidelity, at scale, at low cost and provide resources and information that are targeted and multimodal[11] and effective in improving other diet-related behaviours.[12,13]

The aim of this study was to assess (i) the current use of school-based mobile communication applications from a primary school perspective; (ii) school-level barriers to future implementation of school-based mobile communication applications and (iii) primary school principal's acceptability of using school-based mobile communication applications to deliver messages to parents to improve lunchbox contents. The study also aimed to determine whether the acceptability and feasibility of using school-based mobile communication applications to deliver health messages differed by school characteristics.

2 | METHODS

2.1 | Study design and setting

A cross-sectional telephone survey of primary school principals was conducted in the Hunter New England (HNE) region of New South Wales (NSW), Australia, between February and June 2016.

2.2 | Sample and recruitment

A sample of 338 primary schools in the study region (from a total of 438 primary schools) identified via health service records as having an operational canteen were eligible and invited to participate in the telephone survey. Special-purpose schools and primary schools who

had recently participated in other child nutrition trials by the research team[14,15] were excluded.

2.3 | Data collection and measures

2.3.1 | School characteristics

School sector (Government, Catholic or Independent) and postcode of the schools' geographic locality were obtained from the Australian Governments "My School" website. Principals were also asked to report the number of students enrolled at their school.

2.3.2 | Use of school-based mobile communication applications

Primary school principals were asked whether they had previously used or currently use a school-based mobile communication application to communicate with parents (yes; no; don't know). Principals who indicated that they were not currently using a school-based mobile communication application were asked how likely they were to implement such an app in future (very likely; likely; unlikely; very unlikely) and what would influence their decision to implement the app (open response). Principals who had previously but were not currently using a school-based mobile communication application were asked to report the reason that they were not. Principals who were currently using a school-based mobile communication application were asked how often their school uploads information to the app, whether they would consider changing app providers and what would encourage such a change.

2.3.3 | Acceptability of lunchbox messages being delivered to parents through a school-based mobile communication application

Initially, principals were asked whether they thought the nutritional quality of student lunchboxes needed improving at their school (yes; no; don't know). They were then read a list of statements (see Table 2) pertaining to the communication of lunchbox messages to parents and to what extent they agreed with the statements (using a 4-point Likert scale—strongly agree to strongly disagree).

2.3.4 | Provision of lunchbox guidelines to parents

Principals were also asked to report whether they currently provided advice or information to parents on suitable foods to pack in lunchboxes, inclusion of lunchbox information in kindergarten orientation sessions and/or information packages and current and future use of lunchbox guidelines in their school (yes; no; don't know).

2.4 | Analysis

Data analysis was conducted using SAS 9.3 (SAS Institute, Cary, NC, USA). Descriptive statistics were used to characterise the sample, use of school-based mobile communication applications, acceptability of lunchbox messages and provision of lunchbox guidelines to parents. School postcode was used to classify schools as "urban" or "rural" using the Australian Statistical Geography Standard[16] and as "lower" or "higher" socio-economic status (SES).[17] Chi-square tests were used to examine unadjusted bivariate associations between school characteristics and the following variables of interest: school-based mobile communication application use, acceptability of using school-based mobile communication applications to deliver lunchbox messages and provision of lunchbox guidelines. Statistical tests were 2-tailed with an alpha of 0.05.

3 | RESULTS

3.1 | School characteristics

A total of 196 primary school principals completed the survey (76.6% of those assessed as eligible). Table 1 describes characteristics of those completing the survey. Rural schools and small schools were significantly more likely to complete the survey than their counterparts ($P = 0.003$ and $P = 0.0003$, respectively).

3.2 | Use of school-based mobile communication applications

Most (60%) principals reported currently or previously (3 schools) using a school-based mobile communication application to disseminate information to parents. The 3 principals who had previously used a school-based mobile communication application reported they ceased using the app as they perceived: "it didn't enhance communication to parents" and "other methods for communicating with parents was more effective." Among principals who had never used or

TABLE 1 Primary school characteristics

Characteristic	n (%) N = 196
School sector	
Government	179 (91)
Non-government	17 (9)
School size[a]	
Small (1-129 enrolments)	97 (49)
Large (130+ enrolments)	99 (51)
Rurality[b]	
Urban	75 (38)
Rural	121 (62)
Disadvantage[a]	
Higher socio-economic status	94 (48)
Lower socio-economic status	102 (52)

[a]Dichotomised at the sample median.
[b]Urban = schools located in major cities, Rural = inner regional, outer regional and remote schools.

TABLE 2 Feasibility and acceptability of using a school-based mobile communication application for lunchbox messages by school characteristics

	Overall	School sector (government, non-government[a])	Odds ratio (95% CI; *P*-value)	School Size (small[a], large)	Odds ratio (95% CI; *P*-value)	Rurality (ASGS) (urban, rural[a])	Odds ratio (95% CI; *P*-value)	Disadvantage (SEIFA) (lower SES[a], higher SES)	Odds ratio (95% CI; *P*-value)
Currently or previously used an app (N = 196)	118 (60%)	Government: 108 (60%) Non-government: 10 (59%)	OR = 1.07 (95% CI: 0.39, 2.93; *P* = 0.90)	Small: 37 (38%) Large: 81 (82%)	OR = 7.30 (95% CI: 3.79, 14.04; *P* < 0.001[b])	Urban: 59 (79%) Rural: 59 (49%)	OR = 3.87 (95% CI: 2.01, 7.48; *P* < 0.001[b])	Lower SES: 53 (52%) Higher SES: 65 (69%)	OR = 2.07 (95% CI: 1.15, 3.72; *P* = 0.01[b])
Likelihood of implementing an app in the near future (very likely/likely) (N = 81)	27 (33%)	Government: 24 (32%) Non-government: 3 (43%)	OR = 0.64 (95% CI: 0.13, 3.09; *P* = 0.58)	Small: 18 (29%) Large: 9 (47%)	OR = 2.20 (95% CI: 0.77, 6.31; *P* = 0.14)	Urban: 8 (44%) Rural: 19 (30%)	OR = 1.85 (95% CI: 0.63, 5.42; *P* = 0.26)	Lower SES: 19 (37%) Higher SES: 8 (27%)	OR = 0.61 (95% CI: 0.23, 1.65; *P* = 0.33)
Do you think lunchboxes need improving at your school? (yes) (N = 196)	178 (91%)	Government: 164 (92%) Non-government: 14 (82%)	OR = 2.34 (95% CI: 0.60, 9.08; *P* = 0.21)	Small: 85 (88%) Large: 93 (94%)	OR = 2.19 (95% CI: 0.79, 6.09; *P* = 0.13)	Urban: 66 (88%) Rural: 112 (93%)	OR = 0.59 (95% CI: 0.22, 1.56; *P* = 0.28)	Lower SES: 95 (93%) Higher SES: 83 (88%)	OR = 0.56 (95% CI: 0.21, 1.50; *P* = 0.24)
Appropriate for school to post information on packing a healthy lunchbox on an app (strongly agree/agree) (N = 195)[c]	158 (81%)	Government: 144 (81%) Non-government: 14 (82%)	OR = 0.91 (95% CI: 0.25, 3.34; *P* = 0.88)	Small: 68 (70%) Large: 90 (92%)	OR = 4.80 (95% CI: 2.06, 11.15; *P* < 0.001[b])	Urban: 61 (81%) Rural: 97 (81%)	OR = 1.03 (95% CI: 0.49, 2.16; *P* = 0.93)	Lower SES: 81 (79%) Higher SES: 77 (82%)	OR = 1.12 (95% CI: 0.55, 2.29; *P* = 0.76)
Lunchbox messages (tips, ideas and recipes) would be appropriate to send via a push notification to parents through an app (strongly agree/agree) (N = 195)[c]	158 (81%)	Government: 144 (81%) Non-government: 14 (82%)	OR = 0.91 (95% CI: 0.25, 3.34; *P* = 0.88)	Small: 69 (71%) Large: 89 (91%)	OR = 4.01 (95% CI: 1.78, 9.06; *P* < 0.001[b])	Urban: 62 (83%) Rural: 96 (80%)	OR = 1.19 (95% CI: 0.57, 2.52; *P* = 0.64)	Lower SES: 80 (79%) Higher SES: 78 (83%)	OR = 1.28 (95% CI: 0.62, 2.63; *P* = 0.50)
Supportive of an app that communicates with parents regarding lunchbox messages (strongly agree/agree) (N = 195)[c]	164 (84%)	Government: 148 (83%) Non-government: 16 (94%)	OR = 0.31 (95% CI: 0.04, 2.41; *P* = 0.24)	Small: 76 (78%) Large: 88 (90%)	OR = 2.43 (95% CI: 1.08, 5.48; *P* = 0.03[b])	Urban: 64 (85%) Rural: 100 (83%)	OR = 1.16 (95% CI: 0.52, 2.59; *P* = 0.71)	Lower SES: 87 (86%) Higher SES: 77 (82%)	OR = 0.73 (95% CI: 0.34, 1.58; *P* = 0.42)

(Continues)

TABLE 2 (Continued)

	Overall	School sector (government, non-government[a])	Odds ratio (95% CI; *P*-value)	School Size (small[a], large)	Odds ratio (95% CI; *P*-value)	Rurality (ASGS) (urban, rural[a])	Odds ratio (95% CI; *P*-value)	Disadvantage (SEIFA) (lower SES[a], higher SES)	Odds ratio (95% CI; *P*-value)
Acceptable for a reputable, third party to provide information via an app (strongly agree/agree) (N = 195)[c]	143 (73%)	Government: 128 (72%) Non-government: 15 (88%)	OR = 0.34 (95% CI: 0.08, 1.55; *P* = 0.15)	Small: 63 (65%) Large: 80 (82%)	OR = 2.40 (95% CI: 1.24, 4.64; *P* = 0.008[b])	Urban: 56 (75%) Rural: 87 (73%)	OR = 1.12 (95% CI: 0.58, 2.16; *P* = −0.74)	Lower SES: 76 (75%) Higher SES: 67 (71%)	OR = 0.82 (95% CI: 0.43, 1.54; *P* = 0.53)
Does school provide lunchbox information at kinder orientation? (yes) (N = 195)[c]	169 (87%)	Government: 155 (87%) Non-government: 14 (88%)	OR = 0.92 (95% CI: 0.20, 4.32; *P* = 0.92)	Small: 80 (83%) Large: 89 (90%)	OR = 1.78 (95% CI: 0.76, -4.15; *P* = 0.18)	Urban: 66 (88%) Rural: 103 (86%)	OR = 1.21 (95% CI: 0.51, 2.87; *P* = 0.67)	Lower SES: 89 (87%) Higher SES: 80 (86%)	OR = 0.90 (95% CI: 0.39, 2.05; *P* = 0.80)
Does the school currently have lunchbox guidelines (yes) (N = 196)	98 (50%)	Government: 91 (51%) Non-government: 7 (41%)	OR = 1.48 (95% CI: 0.54, 4.05; *P* = 0.45)	Small: 44 (45%) Large: 54 (55%)	OR = 1.45 (95% CI: 0.82, 2.54; *P* = 0.20)	Urban: 37 (49%) Rural: 61 (50%)	OR = 0.96 (95% CI: 0.54, 1.70; *P* = 0.88)	Lower SES: 55 (54%) Higher SES: 43 (46%)	OR = 0.72 (95% CI: 0.41, 1.26; *P* = 0.25)
If no, would the school consider introducing lunchbox guidelines? (yes) (N = 98)	71 (72%)	Government: 63 (72%) Non-government: 8 (80%)	OR = 0.63 (95% CI: 0.13, 3.18; *P* = 0.57)	Small: 35 (66%) Large: 36 (80%)	OR = 2.06 (95% CI: 0.82, 5.19; *P* = 0.12)	Urban: 31 (82%) Rural: 40 (67%)	OR = 2.21 (95% CI: 0.83, 5.90; *P* = 0.11)	Lower SES: 34 (72%) Higher SES: 37 (72%)	OR = 1.01 (95% CI: 0.42, 2.45; *P* = 0.98)

ASGS, Australian Statistical Geography Standard; SEIFA, Socio-Economic Indexes for Areas; SES, socio-economic status.

[a]Reference value for odds ratio.

[b]Statistically significant at (α =0.05).

[c]One principal refused to provide an answer.

previously used a school-based mobile communication application, 33% reported that they were likely or very likely to use an app in the near future with "cost" and "communication features to parents" reported as the most influential factors (31% and 30%, respectively).

Of the principals currently using a school-based mobile communication application, 89% reported information is uploaded to the app 1-4 times per week, with the remainder uploading content less than weekly but at least once per month. The majority of principals (64%) using a school-based mobile communication application would not consider changing app providers. The principals who would consider changing providers reported "reduced cost" and "improved communication features to parents" as the most common reasons to change (39%, respectively).

Larger schools, schools from higher socio-economic localities and urban schools were more likely to have used a school-based mobile communication application (Table 2).

3.3 | Acceptability of lunchbox messages being delivered to parents through a school-based mobile communication application

The majority of primary school principals (91%) reported that they think lunchboxes need improving at their school. Over 80% of principals agree or strongly agree that it is appropriate for schools to provide: support, information and messages including tips, ideas and recipes on packing a healthy lunchbox, through a school-based mobile communication application. Of these principals, two thirds (67%) indicated that they consider "less than weekly but at least once per month" as an acceptable frequency for lunchbox messages to be sent through the school-based mobile communication application. Additionally, 73% of principals surveyed agree or strongly agree that it would be acceptable for these messages to be provided by a reputable third party.

Compared to smaller schools, larger schools were more accepting of lunchbox messages being delivered through a school-based mobile communication application to parents on a number of such measures (Table 2).

3.4 | Provision of lunchbox guidelines to parents

Over 85% of principals reported providing parents with information on appropriate lunchbox contents at kindergarten orientations. Approximately half of the principals reported their school had lunchbox guidelines. Of those who do not provide lunchbox guidelines, 72% reported that they would consider introducing guidelines on appropriate lunchbox contents at their school.

4 | DISCUSSION

This study is the first to examine the use of school-based mobile communication applications by Australian primary schools and the acceptability of delivering lunchbox messages to parents via this technology. The findings suggest over half of primary schools are currently using a school-based mobile communication application to communicate with parents and that a substantial proportion of primary schools not currently using school-based mobile communication applications expect to be doing so in future. Almost all principals recognised the need for student lunchbox contents to improve, and most agreed that it would be acceptable to utilise a school-based mobile communication application to provide parents with information and support to do so. Collectively, the findings suggest that school-based mobile communication applications represent a potentially potent public health nutrition tool.

A number of disparities exist between the current use of school-based mobile communication applications by school size and location. Larger schools and schools in urban and higher socio-economic localities report greater use of school-based mobile communication applications. Such findings suggest that, currently, there is potential for interventions delivered to parents via this technology to exacerbate existing nutrition inequalities.[18–20] Health promotion programs considering utilising this technology may need to implement strategies to mitigate such risk. Encouragingly, however, acceptability of the intervention content proposed in this study was high, and appeared similarly acceptable among principals regardless of the socio-economic or geographic locality.

A number of study limitations require consideration. The study was conducted in one region of NSW. Therefore, generalisation of the study findings to other areas of NSW or Australia is unknown. The study is also limited in characterising principal perceptions of intervention content and acceptability. The potential impact of lunchbox programs delivered via this modality also requires consideration of the acceptability and engagement of parents in such interventions. Notwithstanding these limitations, the research provides supportive formative evidence for the use of school-based mobile communication applications to deliver lunchbox messages to parents in an effort to improve the content of students' lunchboxes. The findings warrant further investigation and piloting of such an approach.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

Keywords
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