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Associations between perceived friends' support of healthy eating and meal skipping in adolescence

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Ethical standards disclosure: The study was approved by Deakin University's Ethics Committee, the Victorian Department of Education and Training, and the Catholic Education Office (EC 227–2003).
Abbreviations used: YEP (Youth Eating Patterns).

Abstract

Objective: Meal skipping is a relatively common behaviour during adolescence. As peer influence increases during adolescence, friendship groups may play a role in determining eating patterns such as meal skipping. This study examined cross-sectional and longitudinal associations between perceived friends' support of healthy eating and breakfast and lunch skipping among adolescents.

Design: Survey of intrapersonal, social and environmental factors that may influence eating patterns at baseline (2004–2005) and follow-up (2006–2007).

Setting: Thirty-seven secondary schools in Victoria, Australia.

Subjects: Sample of 1785 students aged 12-15 years at baseline.

Results: Adolescents who reported that their friends sometimes or often ate healthy foods with them were less likely to skip breakfast (Sometimes: AOR=0.71; 95% CI=0.57,0.90; Often: AOR=0.54; 95% CI=0.38,0.76) or lunch (Sometimes: AOR=0.41; 95% CI=0.41, 0.89; Often: AOR=0.59; 95% CI=0.37, 0.94) at baseline than those who reported their friends never or rarely displayed this behaviour. Although this variable was associated with lunch skipping at follow-up, there was no evidence of an association with breakfast skipping at follow-up. There was no evidence of an association between perceived encouragement of healthy eating, and an inconsistent relationship between perceived discouragement of junk food consumption, and meal skipping.

Conclusions: Friends eating healthy foods together may serve to reduce meal skipping during early adolescence, possibly due to the influence of directly observable behaviour and shared beliefs held by those in the same friendship group. Verbal encouragement or discouragement from friends may be less impactful an influence on meal skipping (than directly observable behaviours) in adolescents.

Keywords: Adolescents; healthy eating; friend support; meal skipping

1 INTRODUCTION

2

3 Adolescents are a population particularly at risk of nutritional deficiencies due to the increased
4 micronutrient needs for growth, as well as changing lifestyle and eating habits arising from
5 increased independence⁽¹⁾. Thus, regular meal consumption is imperative for optimal health and
6 development during this life stage⁽²⁾. However, skipping meals is a relatively frequent behaviour
7 during middle and late adolescence⁽³⁾, and this behaviour has been found to increase in recent
8 years^(4,5). Despite reporting being aware of its adverse health effects, adolescents are increasingly
9 viewing meal skipping as a quick and effective method for weight loss⁽⁵⁾. Breakfast is typically the
10 most commonly reported missed meal⁽⁶⁻⁹⁾, perhaps explaining why the bulk of existing meal
11 skipping literature has tended to focus on factors that influence breakfast omission⁽¹⁰⁻¹³⁾.

12

13 Unfortunately, nutrient deficiencies associated with meal (particularly breakfast) omission do not
14 appear to be compensated for by dietary changes throughout other times of the day⁽¹⁴⁾. In fact,
15 adolescents who frequently skip breakfast have been found to be more likely to also skip other
16 meals⁽¹⁵⁾. This is concerning since adolescence is the period in which long-term eating habits are
17 established⁽¹⁶⁾ and meal skipping during adolescence can lead to poor health outcomes, such as
18 compromised nutritional status^(14,17), as well as long-term health consequences such as higher body
19 mass index (BMI) and impaired cardiometabolic health⁽¹⁸⁾.

20

21 Adolescents' eating patterns are potentially influenced by a multitude of factors, including personal
22 characteristics such as body weight, lifestyle and psychological factors, and macro systems such as
23 mass media and advertising⁽²⁾. Socio-environmental factors, including the adolescent's family unit,
24 peer and friendship groups, have also been shown to play a role in determining eating
25 behaviours^(3,19). Pearson and colleagues⁽²⁰⁾ investigated associations between maternal behaviour
26 and adolescent meal skipping, finding maternal meal skipping to be a significant predictor of
27 adolescent meal omission. However, this study only examined social influences in the form of
28 potentially maladaptive behaviours (i.e., maternal meal skipping or weight watching) as potential
29 predictors of meal-skipping behaviour. Associations between positive health behaviours, such as
30 healthy eating, and meal skipping were not studied. Further, as an adolescent ages and spends less
31 time at home there is a gradual shift in reliance from family to peers and thus the influence of
32 friends becomes increasingly salient⁽³⁾. Adolescents have reported that the behaviours, attitudes, and
33 especially encouragement from friends influence their food choices and eating patterns⁽²¹⁻²⁴⁾.
34 Therefore, it is possible that identifying important peer-related predictors of adolescent meal
35 skipping may assist in developing nutrition interventions to curtail this unhealthful behaviour.

36

37 A number of studies have examined the relationship between meal skipping and unhealthy dietary
38 outcomes^(20,23-25). For example, the Australian Youth Eating Patterns (YEP) study⁽²⁰⁾ examined
39 peer-related predictors of adolescent meal skipping as a single outcome variable (i.e., not as part of
40 a combined measure such as ‘unhealthy dietary practices’). Results from that study suggested that
41 adolescents were more likely to skip meals if they perceived that their best friend skipped meals,
42 although these associations were found for all meals for girls but only lunch skipping for boys.

43

44 The objective of this research was to expand on previous findings from the YEP study, reanalysing
45 data presented elsewhere^(20,26) to consider broader peer influences, rather than only maternal and
46 best friend influences, on meal skipping. While associations between maladaptive behaviours of
47 others, such as meal skipping and weight watching, have been assessed, no studies have examined
48 associations between positive health behaviours of peers and meal skipping in adolescents. This
49 study considers positive peer support influences since these, if found to be associated with meal
50 skipping, provide greater practical utility for interventions, given that promoting healthy eating may
51 be easier than correcting a maladaptive behaviour. The longitudinal nature of the YEP study
52 provides the advantage over most studies of meal skipping which are cross-sectional, in that it
53 enables assessment of whether influences in early adolescence are associated with meal skipping in
54 later adolescence. Therefore, this study aimed, firstly, to examine if perceived peer support of
55 healthy eating in early adolescence was associated with meal skipping during this time and,
56 secondly, if perceived peer support of healthy eating in early adolescence was associated with meal
57 skipping in later adolescence.

58

59 **METHODS**

60

61 *Participants and setting*

62 Data were drawn from the Youth Eating Patterns study, an online food habits survey of adolescents
63 from Victoria, Australia. Details of the YEP study procedures have been described elsewhere⁽²⁷⁻²⁹⁾.
64 Briefly, a sample of 9842 students from 37 participating schools from Year 7 (aged 12-13 years)
65 and Year 9 (aged 14-15 years) were invited to complete the online survey during 2004-2005
66 (baseline). In total, 3264 adolescents ($n = 2010$ in Year 7, and $n = 1254$ in Year 9; response rate =
67 33% of those invited) completed the survey at baseline. In 2006-2007 (follow-up), 1938 adolescents
68 participated in the study, representing a response rate of 59% of the baseline sample.

69

70 To be eligible for inclusion in the present study, adolescents had to have participated in both waves

71 of data collection and provided data on all variables of interest. The final sample in this complete
72 case analysis consisted of 1785 adolescents (92% of those who completed follow-up). The
73 characteristics of this sample were compared to the baseline sample (Supplementary Table 1).
74 Characteristics were similar for both, although fewer students were from rural schools (25%) in the
75 follow-up study compared to baseline (32%).

76
77 The study was approved by the Ethics Committee of Deakin University, the Victorian Department
78 of Education and Training and the Catholic Education Office (EC 227-2003).

80 *Measures*

81 The YEP study collected information on demographic characteristics of respondents including age,
82 school year (Year 7 or Year 9 at baseline), sex, and region of residence (metropolitan/rural).

84 *Outcome variables*

85 Meal skipping was assessed by asking respondents how often over the past month they had ‘skipped
86 breakfast’, ‘skipped lunch’, and/or ‘skipped dinner’. In this study, dinner skipping was omitted from
87 further analysis due to the small number of students (only 4%) reporting dinner skipping, consistent
88 with past research^(10,12). Responses to breakfast and lunch skipping included ‘not in the last month’,
89 ‘once/twice a month’, ‘once/twice a week’, ‘most days’ to ‘every day’. In the current study,
90 consistent with previous approaches^(20,26,27), adolescents were categorized as ‘frequent skippers’ if
91 they reported skipping meals on ‘most days’ or ‘every day’ and ‘infrequent skippers’ otherwise.

93 *Predictor variables*

94 Three survey items assessed perceived friends’ level of support for healthy eating, and were adapted
95 from a previously validated measure of social support for diet and exercise behaviours⁽³⁰⁾.

96 Respondents were asked to rate how frequently over the past year their friends ‘[ate] healthy foods
97 with [them]’, ‘encouraged [them] not to eat ‘junk’ food [they] felt like’, and ‘encouraged [them] to
98 eat healthy foods’. Response options were ‘never/rarely’, ‘sometimes’, and ‘often’.

100 *Confounders*

101 Prior research has demonstrated sociodemographic factors including sex^(8,10,31,32), age^(4,8,33), and
102 region of residence^(13,34) may influence adolescent meal-skipping behaviour (outcome variable) and
103 sensitivity to peer support (predictor variables). Thus, these variables, measured at baseline, were
104 examined as potential confounders of the association between peer support and meal-skipping.

105

106 ***Maternal and best friend influences***

107 Pearson and colleagues considered both maternal and best friend influences on meal skipping in
108 YEP⁽²⁰⁾. These included the following variables: mother often skips meals ('yes' or 'no/unsure'),
109 mother watches her weight ('yes' or 'no/unsure'), mother models healthy eating ('low' or 'high'),
110 best friend often skips meals ('yes' or 'no/unsure'), best friend watches her weight ('yes' or
111 'no/unsure'), best friend models healthy eating ('low' or 'high').

112

113 **Statistical Analysis**

114 Descriptive statistics were calculated to describe meal skipping, peer support, and the
115 sociodemographic characteristics of participants at baseline and follow-up. To address the first aim,
116 separate logistic regression models were fitted to examine associations between each of the three
117 variables related to perceived friends' support of healthy eating at baseline and each of the meal
118 skipping outcomes at baseline. Unadjusted models were examined, as well as models adjusting for
119 potential confounders. To address the second aim, similar models were fitted for meal skipping
120 outcomes at follow-up, considering the baseline predictors, adjusting for meal skipping at baseline.
121 All models adjusted for the sampling of students from within schools using robust clustered
122 standard errors. In sensitivity analyses, the maternal and best friend influences on meal skipping
123 considered by Pearson and colleagues⁽²⁰⁾ were included in the adjusted models to determine if this
124 affected the estimated associations. Finally, models were fitted to examine the cross-sectional
125 association between perceived friends' support at follow-up and meal skipping at follow-up.
126 Descriptive statistics were conducted using the Statistical Analysis for the Social Sciences software
127 package (SPSS version 21.0 IBM Corp, 2012) and regression models were fitted in Stata 14 (Stata
128 Corporation, College Station, TX, USA, 2015).

129

130 **RESULTS**

131

132 Descriptive statistics are presented in Table 1. At baseline, the adolescent sample consisted
133 predominantly of Year 7 students (65%; mean age: 13.4 years) residing in metropolitan areas
134 (75%). A higher number of girls (56%) than boys participated in both waves of the YEP Study.
135 Breakfast was the most commonly reported missed meal, with a higher frequency of participants
136 reporting frequent breakfast skipping at baseline (18.7%) and follow-up (23.1%) compared to lunch
137 skipping (10.8% at baseline; 9.9% at follow-up). Overall, 60% of adolescents who reported frequent
138 breakfast skipping at baseline also reporting frequent breakfast skipping at follow-up, while only
139 27% of adolescents who reported frequent lunch skipping at baseline reported lunch skipping at
140 follow-up (see Supplementary Tables 2 and 3).

141 *Associations between perceived friends' support of healthy eating and meal skipping*

142

143 *i) Associations between perceived friends' support of healthy eating and meal skipping*
144 *at baseline*

145 Only one of the measures of perceived friends' support of healthy eating was found to be associated
146 with the frequency of meal skipping at baseline: frequency of friends eating healthy food with them
147 (Table 2). The results suggested that adolescents who reported that their friends sometimes ate
148 healthy food with them had lower odds of reporting frequent breakfast skipping (adjusted odds ratio
149 (AOR): 0.71; 95% confidence interval (CI) = 0.57, 0.90) and frequent lunch skipping (AOR: 0.61;
150 95% CI = 0.41, 0.89) at baseline when compared to their peers who reported their friends never or
151 rarely ate healthy foods with them. In addition, the odds of frequent breakfast or lunch skipping
152 were lower for adolescents who reported their friends often ate healthy foods with them at baseline
153 (AOR: 0.54; 95% CI = 0.38, 0.76 and AOR: 0.59; 95% CI = 0.37, 0.94, respectively) compared to
154 those who reported their friends never or rarely ate healthy foods with them. In general, these
155 associations remained after adjustment for either maternal influences or best friend influences (or
156 both) on meal skipping, although estimated AORs were closer to 1 after accounting for best friend
157 influences (Supplementary Table 4). Furthermore, there was no evidence of a difference in odds of
158 lunch skipping for those whose friends often ate healthy foods with them and those whose friends
159 never or rarely ate healthy foods with them after accounting for best friend influences.

160

161 In summary, these results suggest that the higher the level of perceived friend support of healthy
162 eating, the lower the odds of breakfast and/or lunch skipping at baseline.

163

164 *ii) Associations between perceived friends' support of healthy eating and meal skipping*
165 *at follow-up*

166 Despite being found to be associated with the frequency of breakfast skipping at baseline, there was
167 no evidence of an association between friends eating healthy food with them at baseline and
168 frequency of breakfast skipping at follow-up (Table 3). Cross-sectional analyses at the follow-up
169 time point showed similar associations to that of the cross-sectional baseline analysis (Table 4).
170 There was no evidence of a difference in the odds of lunch skipping between those who reported
171 that their friends often ate healthy foods with them compared with those who reported that their
172 friends never ate healthy food with them (AOR: 0.76; 95% CI = 0.50, 1.53), although there was
173 evidence of lower odds of frequent lunch skipping among those whose friends sometimes ate
174 healthy foods with them (AOR: 0.72; 95% CI = 0.46, 0.96). This finding was consistent with cross-
175 sectional analyses at follow-up (Table 4).

176

177 Although not found to be associated with meal skipping at baseline, there was some evidence of an
178 association between friends sometimes discouraging junk food consumption at baseline and
179 breakfast skipping at follow-up (AOR: 1.58; 95% CI = 1.21, 2.07) but not lunch skipping (Table 3).
180 Evidence of an association remained after adjustment for best friend influences (AOR: 1.52; 95%
181 CI = 1.17, 1.98) or maternal influences (AOR: 1.56; 95% CI = 1.18, 2.05) as shown in
182 Supplementary Table 5. This association was also evident in unadjusted cross-sectional follow-up
183 analysis (Table 4) but attenuated in adjusted analysis (AOR: 1.25; 95% CI = 1.00, 1.56). These
184 results are consistent with a hypothesis that increased perceived friend support would be associated
185 with less frequent meal skipping. However, there was no evidence of a difference in frequency of
186 breakfast skipping for those whose friends often discouraged junk food consumption compared to
187 never in either the longitudinal or cross-sectional follow-up analysis (Table 3 and Table 4).

188

189 There was no evidence of an association between friends encouraging healthy food consumption
190 and breakfast or lunch skipping at follow-up in adjusted longitudinal (Table 3) or cross-sectional
191 (Table 4) analyses.

192

193 **DISCUSSION**

194

195 The aim of this study was to examine whether perceived friends' support of healthy eating was
196 associated with frequent breakfast and lunch skipping in a sample of Australian adolescents. This
197 study analysed data previously examined by Pearson and colleagues⁽²⁰⁾, to examine whether
198 maternal and best friend influence as a predictor of meal skipping would extend more generally to
199 broader friendship groups, as it is likely that the behaviour of more than one friend will have a
200 greater impact on behaviour. Further, maternal presence may be non-existent (e.g., single parent
201 households), while friendship presence is more probable. It was hypothesized that adolescents who
202 reported greater levels of perceived friend support (measured as having friends eat healthy foods
203 with them, discourage the consumption of junk food, and encourage the consumption of healthy
204 foods), would be less likely to report meal skipping at baseline and two years later at follow-up.

205

206 Friends' healthy eating (as opposed to meal skipping) behaviour was examined as a potential
207 predictor of meal skipping due to the practical utility of promoting healthy eating versus correcting
208 a maladaptive behaviour in a school and government policy context. Further, best friend meal
209 skipping behaviour was previously examined in this group of adolescents, with results showing
210 increased odds of meal skipping among adolescents whose best friend skipped meals. The results

211 from the analysis of meal skipping frequency at baseline in the present study provided partial
212 support for the first hypothesis, that higher levels of perceived friend support at baseline would be
213 associated with less frequent meal skipping at baseline. Only one aspect of perceived friend support
214 considered in this study was found to be associated with breakfast and lunch skipping at baseline,
215 with adolescents who reported that their friends ate healthy foods with them found to have lower
216 odds of frequent breakfast or lunch skipping. This corresponds with other evidence suggesting that
217 the presence of peers and friends at eating occasions increases adolescents' energy intake and
218 likelihood of meal and snack consumption^(25,35). Friendship group's breakfast intake has been found
219 to be positively associated with adolescent breakfast eating⁽³⁶⁾. This is significant given the known
220 health benefits of regular breakfast consumption, and the fact that breakfast consumption is
221 generally low among adolescents⁽¹⁴⁾. Intervention strategies that have applied school breakfast
222 programs such as grab-n-go breakfasts and social marketing programs have been found to increase
223 breakfast consumption while promoting social norms and interactions, particularly amongst
224 adolescent girls. For adolescents and their friendship groups, consuming breakfast at school could
225 be promoted as a social opportunity⁽³⁶⁾. While the exact mechanism accounting for the effects of
226 peer influences on healthful and frequent eating remains unclear, some studies suggest this effect
227 may be due to modelling, particularly during early adolescence^(23-25,37). Although modelling was not
228 directly assessed in the present study, it is interesting to reflect upon its potential importance when
229 examining peer influence on eating behaviours.

230

231 Modelling regular healthy food consumption by friends may reduce meal skipping in adolescence
232 via a systematic matching of eating patterns⁽²⁵⁾. Adolescents who witness their friends consuming
233 healthy foods are more likely to mimic this behaviour in an attempt to conform and/or integrate
234 themselves to others⁽²⁵⁾. This may in turn reduce adolescents' likelihood of meal skipping on
235 occasions for which their friend is present, e.g., during lunch at school. Adolescents who witness
236 their friends eating healthy foods may also follow suit and consume meals (reducing their
237 likelihood of skipping) in an attempt to create a good impression, and avoid the stigma incurred by
238 overweight individuals who eat "unhealthy" foods⁽²⁵⁾. Indeed perceived peer support for healthy
239 eating has been found to be a negative longitudinal predictor of later fast food intake⁽³⁸⁾. This fear of
240 being associated with traits of overweight individuals may be especially true for adolescent girls
241 and during late adolescence⁽³⁹⁾, possibly explaining why friends eating healthy foods also emerged
242 as a significant predictor of lunch skipping at follow-up.

243

244 While the mechanisms described above are just a few that could potentially explain associations
245 between this type of perceived friend support and lunch skipping, it is interesting to note that

246 adolescents who reported that their friends supported their healthy eating by consuming healthy
247 foods with them were less likely to skip breakfast at baseline, a meal for which their friends are
248 unlikely to be present. This is perhaps unsurprising given research has demonstrated adolescent
249 friendship groups often share similar beliefs and behaviours surrounding food⁽²¹⁻²⁴⁾. Thus, it is likely
250 that adolescents who have friends that demonstrate healthy eating behaviours maintain healthy
251 eating beliefs and habits themselves⁽²⁰⁾. In this instance, it appears that adolescents may not only
252 come to adopt the behaviours their friends model, but may also pick up some of their friends'
253 related nutrition beliefs and values, which may act to influence their own eating behaviours even
254 when their friends are absent.

255

256 Although this study found that having friends who concurrently ate healthy food was negatively
257 associated with meal skipping, there was no evidence of an association between friends' general
258 encouragement of healthy eating and adolescent meal skipping. These findings resemble those of a
259 previous study involving YEP data which found that adolescents who witnessed their best friend
260 skipping meals were more likely to skip themselves but that adolescents who reported their best
261 friend tended to "watch their weight" were no more or less likely to skip⁽²⁰⁾. This result suggests
262 that modelling behaviour may be the more important mechanism influencing adolescent meal
263 skipping. Combined with these earlier findings⁽²⁰⁾, the present results suggest adolescents may be
264 more able to identify specific, obvious behaviour strategies in their friends (in this context,
265 observable healthy eating behaviours) and adopt these behaviours themselves to a greater extent
266 than when they receive more general dietary encouragement.

267

268 Although there was some evidence to support the hypothesis that increased perceived friend support
269 was associated with less frequent meal skipping in adolescents at baseline, it was less clear that
270 perceived friend support at this earlier stage was associated with meal skipping frequency in later
271 adolescence. While the results suggested that friends eating healthy foods with them was associated
272 with reduced odds of lunch skipping two years later, this was not the case for breakfast skipping.
273 Furthermore, none of the other measures of perceived friend support were found to reduce the odds
274 of meal skipping at follow-up. On the contrary, friends' discouragement of junk food consumption
275 served to increase the odds of breakfast skipping, an unexpected result, although there was only
276 evidence of increased odds of breakfast skipping for those whose friends sometimes discouraged
277 junk food consumption. While this may be a chance finding as there was no association between
278 this support variable and any other meal skipping outcomes examined, the avoidance of junk food is
279 a common weight-loss strategy employed during adolescence, as is meal skipping. Therefore, it is
280 possible that encouragement from peers to avoid foods deemed as "unhealthy" is reflective of a

281 friendship subculture that emphasizes the importance of thinness, joint-dieting, and
282 restriction^(20,23,24,40). This is particularly the case for older adolescent girls, who research
283 demonstrates are more likely to aspire to a thin ideal and engage in extreme weight-loss
284 behaviours^(41,42). This might explain why there was only evidence of an association between friends
285 discouraging junk food consumption and breakfast skipping at follow-up. While it is interesting that
286 there was no evidence of an association between discouragement of junk food consumption and
287 lunch skipping at follow-up (for which peer presence is likely), the single aforementioned
288 significant result for this variable was not consistent across time-points or meals, further suggesting
289 it was a chance finding.

290

291 Given the associations between baseline predictors and meal skipping at follow-up were not
292 consistent with those observed at baseline and were not as clear, it could be the case that friends'
293 support of healthy eating has a more immediate effect on adolescent eating patterns that wanes over
294 time. If this were the case, as the present results would suggest, such influences would be more
295 readily detected in cross-sectional analyses, as opposed to longitudinal analyses conducted over a
296 relatively extended time period. However, as cross-sectional associations at follow-up were similar
297 to the longitudinal associations, one possible explanation for the differences in associations at later
298 age groups may be that factors considered to be important (and therefore influence behaviour) early
299 in life are no longer as important at later life. As adolescents age and become more independent,
300 directly observable behaviours of their peers may have less influence on their own behaviour, as
301 their sense of identity develops⁽⁴³⁾. Another possible explanation for the less pronounced effect of
302 predictors at follow-up may be that participants had a different friendship group when examined
303 two years later than when first examined at baseline, potentially changing the social environment
304 influencing their behaviour. It is likely that as adolescents age, they develop new interests,
305 personality traits, and as a result may no longer relate to the same friends they had at an earlier
306 developmental stage.

307

308 Despite the novel findings of this study, it was not without its limitations. Perceived friends'
309 encouragement of healthy eating may not reflect reality, as support can be a discrete, non-verbal
310 behaviour that is open to misinterpretation. Similarly, in the present study meal-skipping was self-
311 reported and, as with perceived friend support, may have been subject to reporting biases
312 (particularly social desirability), and an increased likelihood of measurement error⁽⁴⁴⁾. Future
313 studies should examine friends' support of healthy eating by collecting convergent behavioural
314 data. Further, the reach of the YEP Study as a whole was low (46%). However, this is analogous to
315 that of other large-scale longitudinal studies⁽⁴⁴⁻⁴⁶⁾, and the sample size in the present study was

316 substantial. Although, it is important to note that only 1938 participants of the 3264 adolescents
317 who took part in the baseline survey consented to be contacted to participate in follow-up which
318 may limit the generalizability of these findings. Furthermore, as data were collected from schools
319 located within a single geographic region, external validity is limited, which also has implications
320 for the generalizability of the findings to the wider population. Further research is therefore required
321 to confirm these findings.

322

323 Notwithstanding these limitations, the present study has numerous strengths. Several previously
324 unexamined behaviours measuring perceived friends' support of healthy eating were investigated in
325 relation to adolescent meal skipping. Data were drawn from a large sample of demographically
326 diverse adolescents. The design employed in the current study also allowed for both cross-sectional
327 and longitudinal associations to be examined.

328

329 **Conclusions**

330 Overall, the present findings suggest that certain socio-environmental factors that promote healthy
331 eating behaviours may be important to consider when developing nutrition promotion initiatives
332 aimed at reducing unhealthy and disordered eating behaviours in adolescents. Findings suggest
333 adolescents may respond more immediately to directly observable healthy eating behaviours in their
334 friends as opposed to more general encouragements to eat healthy foods or avoid junk foods.
335 Shared beliefs may be the underlying mechanism explaining this association between directly
336 observable dietary behaviour in friends and adolescent meal skipping, as evidenced by the fact that
337 friends eating healthy food appeared to influence meal skipping for meals (i.e., breakfast) eaten at
338 home, where friends' presence is unlikely. Future nutrition promotion strategies should aim to
339 encourage a peer subculture that promotes healthy eating patterns, including the regular
340 consumption of nourishing whole foods.

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Table 1 Summary statistics for YEP adolescents who completed both baseline and follow-up surveys ($N = 1785$)

Measure	<i>n</i>	%
Outcome variables [†]		
Skips breakfast		
Frequent skippers		
Baseline (2004/05)	334	18.7
Follow-up (2006/07)	413	23.1
Skips lunch		
Frequent skippers		
Baseline (2004/05)	193	10.8
Follow-up (2006/07)	177	9.9
Predictor variables		
Friends eat healthy foods with you		
Never/rarely	512	28.7
Sometimes	807	45.2
Often	466	26.1
Friends encourage you not to eat 'junk food'		
Never/rarely	1116	62.5
Sometimes	507	28.4
Often	162	9.1
Friends encourage you to eat healthy foods		
Never/rarely	972	54.5
Sometimes	557	31.2
Often	256	14.3
Socio-demographic characteristics		
Sex		
Girls	996	55.8
Boys	789	44.2
School year		
Year 7 (Year 9 at follow-up)	1155	64.7
Year 9 (Year 11 at follow-up)	630	35.3
Region		
Metro	1335	74.8
Rural	450	25.2

Metro., Metropolitan

[†]Skipping meals: adolescents were classified as 'frequent skippers' (of breakfast, lunch) if they reported skipping meals on 'most days' or 'every day', and 'infrequent' skippers if they reported otherwise.

Table 2 Associations between perceived friends' support of healthy eating and frequency of breakfast and lunch skipping at baseline (2004/05) among Australian adolescents ($N=1785$)

Measure	Breakfast skipping				Lunch skipping			
	Unadjusted†		Adjusted‡		Unadjusted†		Adjusted ‡	
	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI
Friends eat healthy food with you§								
Sometimes	0.75*	0.60, 0.99	0.71**	0.57, 0.90	0.62*	0.42, 0.90	0.61**	0.41, 0.89
Often	0.60**	0.43, 0.83	0.54***	0.38, 0.76	0.60*	0.37, 0.97	0.59*	0.37, 0.94
Sex			1.77***	1.39, 2.26			1.28	0.89, 1.84
Year level			1.23	0.94, 1.61			1.25	0.82, 1.90
Region			0.80	0.55, 1.14			0.79	0.54, 1.17
Friends discourage 'junk' food								
Sometimes	0.93	0.70, 1.25	0.92	0.69, 1.22	0.96	0.76, 1.23	0.97	0.76, 1.23
Often	0.88	0.58, 1.34	0.89	0.58, 1.35	0.69	0.37, 1.29	0.70	0.38, 1.29
Sex			1.63***	1.30, 2.05			1.19	0.84, 1.69
Year level			1.28*	0.98, 1.68			1.29	0.86, 1.93
Region			0.79	0.54, 1.15			0.78	0.52, 1.17
Friends encourage healthy food								
Sometimes	1.07	0.80, 1.42	1.03	0.77, 1.38	0.89	0.63, 1.27	0.89	0.62, 1.27
Often	1.09	0.76, 1.57	1.08	0.74, 1.57	0.89	0.63, 1.24	0.90	0.64, 1.28
Sex			1.62***	1.29, 2.03			1.20	0.84, 1.71
Year level			1.30	0.98, 1.71			1.29	0.85, 1.94
Region			0.79	0.54, 1.15			0.78	0.53, 1.16

OR. Odds ratio. CI. Confidence interval.

* $P<0.05$; ** $P<0.01$; *** $P<0.001$.

†Unadjusted logistic regression analyses of the association between each perceived friends' support of healthy eating measure and each of the meal skipping outcomes at baseline with clustered standard errors to account for clustering within school. The Hosmer and Lemeshow goodness-of-fit statistic was acceptable for all unadjusted baseline models (all test statistics ($df = 6, n = 1785$) < 7.18 , all p -values > 0.305).

‡Adjusted logistic regression analyses of the association between each perceived friends' support of healthy eating measures and each of the meal skipping outcomes at baseline adjusting for adolescent sex, school year, region of residence, with clustered standard errors to account for clustering within school.

§Never/rarely was used as the reference category for perceived friend support predictor variables in all models.

||Reference categories: male, Year 7, Metropolitan.

Table 3 Associations between perceived friends' support of healthy eating and frequency of breakfast and lunch skipping at follow-up (2006/07) among Australian adolescents ($N=1785$)

Measure	Breakfast skipping				Lunch skipping				
	Unadjusted†		AOR	Adjusted‡		Unadjusted†		Adjusted‡	
	OR	95% CI		95% CI	95% CI	OR	95% CI	AOR	95% CI
Friends eat healthy food with you§									
Sometimes	0.86	0.70, 1.10	0.93	0.74, 1.16	0.68*	0.48, 0.96	0.72*	0.46, 0.96	
Often	0.83	0.63, 1.10	0.95	0.70, 1.28	0.79	0.52, 1.22	0.76	0.50, 1.53	
Sex			1.44***	1.16, 1.78			1.23	0.89, 1.69	
Year level			1.11	0.89, 1.39			0.99	0.71, 1.37	
Region			0.89	0.70, 1.12			0.74	0.50, 1.08	
Friends discourage 'junk' food									
Sometimes	1.44**	1.14, 1.81	1.58**	1.21, 2.07	0.99	0.61, 1.60	0.98	0.60, 1.59	
Often	1.07	0.72, 1.57	1.15	0.75, 1.75	0.99	0.57, 1.73	1.01	0.57, 1.99	
Sex			1.39**	1.13, 1.71			1.15	0.80, 1.66	
Year level			1.15	0.91, 1.45			0.94	0.55, 1.61	
Region			0.90	0.71, 1.14			0.76	0.49, 1.17	
Friends encourage healthy food									
Sometimes	1.22	0.98, 1.51	1.20	0.98, 1.46	0.82	0.51, 1.32	0.82	0.49, 1.35	
Often	1.34	0.96, 1.86	1.35	1.00, 1.81	0.96	0.57, 1.62	0.97	0.60, 1.58	
Sex			1.39**	1.13, 1.72			1.16	0.82, 1.66	
Year level			1.14	0.91, 1.43			0.93	0.55, 1.58	
Region			0.88	0.70, 1.18			0.75	0.49, 1.16	

OR. Odds ratio. CI. Confidence interval.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

†Unadjusted logistic regression analyses of the association between each perceived friends' support of healthy eating measure and each of the meal skipping outcomes at follow-up with clustered standard errors to account for clustering within school. The Hosmer and Lemeshow goodness-of-fit statistic was acceptable for all unadjusted baseline models (all test statistics ($df = 6, n = 1785$) < 8.97 , all p -values > 0.175).

‡Adjusted logistic regression analyses of the association between each perceived friends' support of healthy eating measures and each of the meal skipping outcomes at follow-up, adjusting for baseline meal skipping, adolescent sex, school year, region of residence, with clustered standard errors to account for clustering within school.

§Never/rarely was used as the reference category for perceived friend support predictor variables in all models.

||Reference categories: male, Year 7, Metropolitan.

Table 4 Cross-sectional associations between perceived friends' support of healthy eating and frequency of breakfast and lunch skipping at follow-up (2006/07) among Australian adolescents (N=1785)

Measure	Breakfast skipping				Lunch skipping			
	Unadjusted†		Adjusted‡		Unadjusted†		Adjusted ‡	
	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI
Friends eat healthy food with you§								
Sometimes	0.75	0.59, 0.96*	0.71	0.57, 0.89**	0.69	0.47, 1.00	0.68	0.47, 0.99
Often	0.70	0.51, 0.97*	0.60	0.43, 0.84**	0.42	0.28, 0.63***	0.39	0.25, 0.61***
Sex			1.74	1.44, 2.11***			1.36	0.92, 2.01
Year level			1.22	1.00, 1.50			1.00	0.61, 1.65
Region			0.85	0.67, 1.06			0.75	0.47, 1.19
Friends discourage 'junk' food								
Sometimes	1.27	1.02, 1.60*	1.25	1.00, 1.56	0.89	0.70, 1.15	0.89	0.69, 1.13
Often	1.05	0.76, 1.44	1.03	0.75, 1.40	0.84	0.52, 1.34	0.83	0.51, 1.34
Sex			1.61	1.33, 1.94***			1.19	0.84, 1.69
Year level			1.20	0.97, 1.49			1.00	0.60, 1.69
Region			0.83	0.65, 1.06			0.73	0.46, 1.17
Friends encourage healthy food								
Sometimes	1.13	0.92, 1.38	1.07	0.88, 1.29	1.07	0.73, 1.55	1.05	0.72, 1.53
Often	1.36	1.05, 1.76*	1.26	0.98, 1.63	1.01	0.65, 1.59	0.98	0.60, 1.59
Sex			1.58	1.32, 1.90			1.18	0.82, 1.70
Year level			1.21	0.97, 1.51			1.00	0.59, 1.69
Region			0.84	0.66, 1.06			0.73	0.46, 1.17

OR. Odds ratio. CI. Confidence interval.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

†Unadjusted logistic regression analyses of the association between each perceived friends' support of healthy eating measure and each of the meal skipping outcomes at follow-up with clustered standard errors to account for clustering within school. The Hosmer and Lemeshow goodness-of-fit statistic was acceptable for all unadjusted models (all test statistics ($df = 6, n = 1785$) < 7.18 , all p -values > 0.305).

‡Adjusted logistic regression analyses of the association between each perceived friends' support of healthy eating measures and each of the meal skipping outcomes at follow-up adjusting for adolescent sex, school year, region of residence, with clustered standard errors to account for clustering within school.

§Never/rarely was used as the reference category for perceived friend support predictor variables in all models.

||Reference categories: male, Year 9, Metropolitan.

