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Short Communication

Socio-economic disparities in Australian adolescents' eating behaviours

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Abstract

Objective: To assess the association between socio-economic position (SEP) and poor eating behaviours in a large representative sample of Australian secondary-school students.

Design: Cross-sectional survey of students' vegetable, fruit, sugar-sweetened beverage and fast-food consumption assessed using validated instruments and collected via a web-based self-report format.

Setting: Secondary schools across all Australian states and territories.

Subjects: Secondary-school students (n 12 188; response rate: 54 %) aged 12–17 years participating in the 2009–10 National Secondary Students' Diet and Activity (NaSSDA) survey.

Results: Overall, 25 % of students reported consuming ≤1 serving of vegetables/d and 29 % reported eating ≤1 serving of fruit/d. Fourteen per cent of students reported drinking at least 1–2 cups of sugar-sweetened beverages/d while 9 % reported eating fast food ≥3 times/week. After adjusting for other demographic factors, students of lower-SEP areas were more likely to report low intake of vegetables ($F(4, 231) = 3{\cdot}61$, $P = 0{\cdot}007$) and high frequency of consumption of sugar-sweetened beverages ($F(4, 231) = 8{\cdot}41$, $P < 0{\cdot}001$) and fast food ($F(4, 231) = 4{\cdot}59$, $P = 0{\cdot}001$) compared with students of high-SEP neighbourhoods. A positive SEP association was found for fruit consumption among female students only ($F(4, 231) = 4{\cdot}20$, $P = 0{\cdot}003$). Those from lower-SEP areas were also more likely to engage in multiple poor eating behaviours ($F(4, 231) = 5{\cdot}80$, $P < 0{\cdot}001$).

Conclusions: Results suggest that socio-economic disparities in Australian adolescents' eating behaviours do exist, with students residing in lower-SEP neighbourhoods faring less well than those from high-SEP neighbourhoods. Reducing social inequalities in eating behaviours among young people should be a key consideration of future preventive strategies.

Keywords
Socio-economic position
Diet
Adolescents
Australia

Socio-economic position (SEP) is inversely associated with obesity in adolescents[1] and with poorer adolescent diets. International research and review articles have generally found that low SEP is associated with lower consumption of fruit and vegetables among adolescents[2–8]. However, Australian data are less definitive. A national survey of 654 adolescents found a significant positive association between SEP and fruit consumption (both sexes) and vegetables (girls only)[9], a community-based study of 2529 Victorian adolescents found a positive association between SEP and adolescent fruit consumption[10], while a cross-sectional survey of more than 18 000 Australian secondary students found no significant association between SEP and adolescent fruit and vegetable consumption[11].

There has been considerably less research conducted assessing the association between SEP and adolescent

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consumption of energy-dense and nutrient-poor foods such as fast foods and sugar-sweetened beverages. Of the available Australian data, the association is generally negative, with adolescents of lower SEP consuming higher amounts of fast foods[10,11] and sugar-sweetened beverages[12]. Internationally, Wardle *et al.*[7] found that lower SEP was associated with high-fat diets, while Vereecken *et al.*[5] reported that socio-economic differences in sugar-sweetened beverage consumption varied depending on the measure of disadvantage used.

Due to the limited Australian data, the aim of the current study was to assess the association between SEP and poor eating behaviours in a large representative sample of Australian secondary-school students.

Methods

Design and procedure

Data were obtained from students participating in the National Secondary Students' Diet and Activity (NaSSDA) survey 2009–10 (school response rate: 39 %; student response rate: 54 %). A full description of the methods has been reported elsewhere[1]. In brief, the sampling procedure was a stratified two-stage probability design, with schools (government, Catholic and independent) randomly selected at the first stage of sampling and classes selected within schools at the second stage. A web-based self-report questionnaire assessing students' eating, physical activity and sedentary behaviour was administered to participants in their regular class groups, and anthropometric measurements of students' height, weight and waist circumference were taken by trained researchers in a confidential setting. Active parental consent was required for students to participate in each component of the study.

Measures

Eating behaviours

Short dietary questions developed by the NSW Centre for Public Health Nutrition for the purpose of population-based monitoring surveys were used to assess students' eating behaviour[13]. These items have moderate to good validity and reliability among Australian children aged 10 to 12 years[14]. Students were asked to indicate how many servings of vegetables (not including potatoes, hot chips or fried potato) and how many servings of fruit (not including fruit juice) they usually eat each day. Students were shown on-screen visual aids and informed that a serving of vegetables is half a cup of cooked vegetables or one cup of salad vegetables, while a serving of fruit is one medium piece, two small pieces or one cup of diced fruit. Response options ranged from 'less than one serving per day' to 'six or more servings per day', with students also able to indicate they did not eat fruit or vegetables.

Intake of key non-core foods was assessed by asking students to indicate how frequently they consume sugar-sweetened beverages (e.g. soft drinks, cordials and sports drinks) and how often they have meals or snacks such as burgers, pizza, chicken or chips from fast-food or take-away-food places. Response options ranged from 'one cup (250 ml) per week' to 'five or more cups per day' for sugar-sweetened beverages and from 'less than once a week' to 'two or more times per day' for fast food. Students were also given the option to report they never eat or drink these types of foods and beverages.

Responses were dichotomised to assess poor eating behaviours. As per Thompson *et al.*[15] and Martinez-Gonzalez *et al.*[16], low vegetable and fruit consumption was defined as one serving or less per day. High sugar-sweetened beverage consumption was defined as at least one to two cups per day, while high fast-food consumption was classified as three or more times per week. Cut-points for energy-dense and nutrient-poor items were selected to include the highest frequency possible while ensuring sufficient cell sizes.

The number of poor eating behaviours (low fruit, low vegetable, high sugar-sweetened beverage and high fast-food consumption) students engaged in (0–4 behaviours) was also calculated and dichotomised to assess clustering of multiple (two or more) poor eating behaviours.

Socio-economic position

A measure of SEP was determined according to the Socio-Economic Index for Areas Index of Relative Socio-Economic Disadvantage, based on the student's home postcode[17]. Students were categorised into SEP groups using the national deciles to create quintiles (first quintile: most disadvantaged; fifth quintile: least disadvantaged).

Potential confounders

Measurements of students' height and weight were taken in accordance with standardised protocols[18] and used to calculate BMI (weight/height^2). Students were classified as either healthy weight/underweight or overweight/obese according to internationally recognised cut-offs developed for children and adolescents[19].

Information on students' sex and school year was collected. Postcode of residence was also used to classify the geographic location of students as either metropolitan or rural/regional according to the Rural, Remote and Metropolitan Areas Classification[20].

Statistical analyses

Data were analysed using the statistical software package Stata SE 11·1 and weighted by state, education sector, school year and sex to ensure the sample obtained reflected the population distribution[21]. Separate logistic regression analyses examined the association between SEP and students' vegetable, fruit, sugar-sweetened beverage and fast-food consumption, and adjusted Wald

tests were used to identify significant SEP differences. All models controlled for sex, school year, geographic location, school-level clustering and education sector (government, Catholic and independent). Exploratory analyses were conducted with BMI category included as an additional control variable; however, as the pattern of results was comparable to what was found when BMI category was excluded, these data are not reported. Adjusted proportions estimated from the model and adjusted odds ratios and confidence intervals are reported in Table 2. Interactions between sex and SEP were tested, with significant results reported in the text.

Students were excluded from the sample if they were outside the target age range (n 53), had not completed at least 33 % of the survey questions (n 223), had not had their physical measurements taken (n 1515), or if no index value was available for their postcode (n 87). A total of 12 188 students were included in the final sample for analysis. Due to the large sample size, a conservative level of statistical significance ($P < 0{\cdot}01$) was applied.

Results

As shown in Table 1, of the 12 188 students, 53 % were male. There was a slightly higher proportion of students in Years 8 (31 %) and 9 (27 %) and the majority of students lived in metropolitan locations (64 %). Twenty-six per cent of students were categorised as being in the fifth SEP quintile while 14 % were in the first SEP quintile (compared with 26 % in the fifth SEP quintile and 15 % in the first SEP quintile for the Australian population)[22].

Overall, one-quarter of students reported consuming ≤1 serving of vegetables/d and 29 % reported consuming ≤1 serving of fruit/d. Fourteen per cent of students reported drinking at least 1–2 cups of sugar-sweetened beverages/d and approximately one in ten (9 %) reported consuming fast food ≥3 times/week.

Table 1 Demographic characteristics of the study population: secondary-school students (n 12 188) aged 12–17 years participating in the 2009–10 National Secondary Students' Diet and Activity (NaSSDA) survey, Australia

	Frequency, n	Percentage
Sex		
Male	6460	53·0
Female	5728	47·0
Year level		
Year 8	3772	30·9
Year 9	3340	27·4
Year 10	2647	21·7
Year 11	2429	19·9
Socio-economic position		
1st quintile (most disadvantaged)	1757	14·4
2nd quintile	2175	17·8
3rd quintile	2525	20·7
4th quintile	2537	20·8
5th quintile (least disadvantaged)	3194	26·2
Geographic location		
Metropolitan	7841	64·3
Rural	4347	35·7

Figures based on unweighted data. Percentages may not sum to 100 % due to rounding.

After adjustment for all covariates in the model, adolescent vegetable ($F(4, 231) = 3{\cdot}61$, $P = 0{\cdot}007$), sugar-sweetened beverage ($F(4, 231) = 8{\cdot}41$, $P < 0{\cdot}001$) and fast-food consumption ($F(4, 231) = 4{\cdot}59$, $P = 0{\cdot}001$) differed significantly by SEP (see Table 2). Specifically, students from the first, third and fourth quintiles were more likely than students from the fifth quintile to report low consumption of vegetables. Those from the first through fourth quintiles were more likely to report high frequency of consumption of sugar-sweetened beverages. Students from the first through third quintiles were more likely to report high fast-food consumption compared with those from the fifth quintile.

A significant sex-by-SEP interaction was found for students' fruit consumption ($F(4, 231) = 3{\cdot}68$, $P = 0{\cdot}006$). Separate logistic regression models for males and females indicated that fruit consumption varied by SEP only among females ($F(4, 231) = 4{\cdot}20$, $P = 0{\cdot}003$). Specifically, females in the first (OR = 1·50; 95 % CI 1·16, 1·93, $P = 0{\cdot}002$), third (OR = 1·69; 95 % CI 1·31, 2·18, $P < 0{\cdot}001$) and fourth (OR = 1·38; 95 % CI 1·09, 1·74, $P = 0{\cdot}007$) quintiles were more likely than females in the fifth quintile to report low fruit consumption.

Approximately half (49 %) of students did not engage in any of the four poor eating behaviours. Thirty-two per cent of students engaged in one, 15 % in two, 4 % in three and 1 % in four poor eating behaviours. Logistic regression analysis indicated that clustering of poor eating behaviours differed significantly by SEP ($F(4, 231) = 5{\cdot}80$, $P < 0{\cdot}001$), with those from the first through fourth quintiles more likely to report two or more poor eating behaviours compared with students from the fifth quintile (Table 2).

Discussion

The current study provides evidence of an association between SEP and poor eating behaviours among a large representative sample of Australian secondary-school students. Adolescents residing in high-SEP areas were less likely to report low vegetable, low fruit (girls only), high sugar-sweetened beverage and high fast-food consumption. These results are consistent with a number of previous Australian studies[9,10], international studies[5–8] and review articles[2–4] reporting lower fruit and vegetable intake and higher fast-food and sugar-sweetened beverage consumption among adolescents of lower SEP. However, the findings differ from a large study of Australian adolescents[11] which found that adolescent fruit and vegetable consumption was unrelated to SEP. These equivocal findings may be attributed to the differences in

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Table 2 Consumption of vegetables, fruit, sugar-sweetened beverages and fast food, and clustered poor eating behaviours, by quintile of socio-economic position (SEP) among secondary-school students (*n* 12 188) aged 12–17 years participating in the 2009–10 National Secondary Students' Diet and Activity (NaSSDA) survey, Australia

	Low vegetable consumption (≤1 serving/d, *n* 12 106)			Low fruit consumption (≤1 serving/d, *n* 12 103)			High sugar-sweetened beverage consumption (at least 1–2 cups/d, *n* 12 072)			High fast-food consumption (≥3 times/week, *n* 12 035)			Clustered poor eating behaviours (2–4 poor behaviours, *n* 12 031)		
SEP quintile	Adj. OR	95 % CI	Adj. proportion (%)	Adj. OR	95 % CI	Adj. proportion (%)	Adj. OR	95 % CI	Adj. proportion (%)	Adj. OR	95 % CI	Adj. proportion (%)	Adj. OR	95 % CI	Adj. proportion (%)
1st quintile	1·48*	1·17, 1·87	27·6	1·18	0·98, 1·41	29·3	1·82**	1·43, 2·31	16·2	1·91**	1·37, 2·68	11·7	1·77**	1·40, 2·25	22·8
2nd quintile	1·28	1·04, 1·57	24·8	1·13	0·92, 1·38	28·4	1·87**	1·40, 2·50	16·6	1·81*	1·30, 2·54	11·2	1·61**	1·24, 2·09	21·2
3rd quintile	1·41*	1·16, 1·72	26·7	1·20	1·00, 1·44	29·7	1·76**	1·34, 2·32	15·8	1·71*	1·24, 2·36	10·6	1·65**	1·27, 2·16	21·6
4th quintile	1·29*	1·08, 1·54	24·9	1·20	1·00, 1·43	29·6	1·49**	1·21, 1·82	13·7	1·31	1·01, 1·71	8·4	1·47*	1·17, 1·85	19·7
5th quintile	1·00	Ref.	20·5	1·00	Ref.	26·0	1·00	Ref.	9·7	1·00	Ref.	6·5	1·00	Ref.	14·4

Adj., adjusted; Ref., referent category.
Odds ratios and proportions adjusted for sex, school year, geographic location, school-level clustering and education sector.
*$P < 0·01$, **$P < 0·001$.

fruit and vegetable consumption classifications used between the studies. While the current study explored low consumption, Scully *et al.*[11] focused on whether adolescents were meeting the recommended daily consumption of fruit and vegetables.

The difference in fruit consumption among girls of varying SEP, but not boys, may be attributable to females placing greater importance on avoiding weight gain when making food choices[23] and placing greater value on healthy eating[24]. Wardle and Marsland[25] found that girls from higher-SEP schools were more likely to show weight concern and report dieting behaviours. The availability of fruit in the home is strongly related to SEP[26–28] and is also more consistently positively associated with consumption in girls than in boys[29]. On the other hand, the lack of association between SEP and boys' fruit intake may be attributed to their food choices being more strongly influenced by factors which may be unrelated to SEP such as peer norms and social influences[23] as well as taste preference[30,31]. Given reviews have also found that disparities in dietary behaviours can vary when assessed using an area-based measure of SEP[2–4], it would be beneficial for future research to aim to replicate these findings using individual-level SEP measures such as household income and parental education in addition to area-based measures.

It was notable that results in the current study did not support a clear socio-economic gradient. While poor eating behaviours were clearly less prevalent among high-SEP adolescents, similar proportions were generally observed for adolescents in the lower four SEP quintiles. Although the proportion of adolescents reporting low vegetable consumption in the second quintile did not significantly differ from that in the least disadvantaged group, there was an apparent trend ($P = 0·022$) in the expected direction.

Based on the adjusted odds ratios, the magnitude of SEP differences found in the current study for low vegetable consumption was weaker in comparison to those found for high sugar-sweetened beverage and fast-food consumption. However, the actual percentage difference between the low- and high-SEP groups was comparable across these three food categories (between 5 and 7 %), and is of practical significance when considering the potential impact at the population level.

Some study limitations need to be acknowledged. First, the cross-sectional study design precludes inferences of causality. Second, self-reported behaviour allows the possibility of recall and social desirability bias. For example, adolescents may have under-reported their fast-food and sugar-sweetened beverage consumption and over-reported their vegetable and fruit consumption. We would expect, however, that under- and/or over-reporting would have been similar across SEP quintiles. Lastly, the current study used an area-based measure of SEP and did not also include individual-level measures. A strength of the study was the large representative sample size.

Findings suggest there are SEP disparities in Australian adolescents' eating behaviours, with those residing in lower-SEP neighbourhoods faring less well than those from high-SEP neighbourhoods. Additional research is needed to determine the underlying mechanisms for these observed differences, with nutrition knowledge[32,33], availability of foods within the home[34] and perceived cost of fresh produce[35] all possible contributing factors. Reducing social inequalities in eating behaviours among young people should be a key consideration of future preventive strategies.

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