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RESEARCH ONLINE

Short Communication

Influences on consumption of soft drinks and fast foods in adolescents

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Soft drink and fast food are energy dense foodstuffs that are heavily marketed to adolescents, and are likely to be important in terms of risk of obesity. This study sought to examine the influences on soft drink and fast food consumption among adolescents as part of a cross-sectional survey of 2,719 adolescents (aged 11-16) from 93 randomly selected schools in New South Wales, Australia. Students provided information on soft drink and fast food consumption, and responded to statements examining influences over consumption. Over half of the boys and more than one third of the girls reported drinking soft drink daily, and consumption peaked in Grade 8 students. A quarter of students reported choosing soft drinks instead of water or milk, and around 40% agreed that soft drink was usually available in their homes. Availability in the home and drinking soft drinks with meals was most strongly associated with consumption in all age groups. Fast food consumption was higher among boys than girls in all age groups. Convenience and value for money yielded the strongest associations with fast food consumption in boys, while preferring fast food to meals at home and preferring to "upsize" meals were most strongly associated with consumption in girls. Interventions to reduce consumption of soft drinks should target availability in both the home and school environment by removing soft drinks and replacing them with more nutritive beverages. Fast food outlets should be encouraged to provide a greater range of healthy and competitively priced options in reasonable portions.

Key Words: adolescent, obesity, fast food, soft drink, weight gain

INTRODUCTION

Obesity is one of the most important public health problems facing adolescents in developed countries, with recent data from Australia suggesting that the combined prevalence of overweight and obesity is 25% among adolescents aged 11-16.[1] In the United States and the United Kingdom, the prevalence of obesity and of excess abdominal fat have continued to increase over the past decade.[2,3] Health authorities are concerned because obese adolescents may suffer a number of health problems, are likely to remain overweight into adulthood and are at risk of serious, chronic conditions including cardiovascular disease, type 2 diabetes and fatty liver disease.[4,5]

Soft drink and fast food are energy dense foodstuffs that are heavily marketed to adolescents.[6-8] In the United States, the average daily consumption of soft drink was almost two standard cans (24 oz/700 ml) for boys and just over one standard can for girls (12 oz/350 ml), and increasing consumption has been shown to be associated with weight gain.[6,9] Fast food consumption is positively associated with energy intake and soft drink consumption, and negatively associated with fruit, vegetable and milk intakes in adolescents.[10] Both soft drink and fast food consumption may adversely affect health: a recent meta-analysis found an overall significant positive association between soft drink consumption and body weight in all age groups while among young adults aged 18-30, those who ate fast food more than twice a week were more likely to gain weight and develop insulin resistance.[11,12]

Soft drink and fast foods are very popular with adolescents, who are at a stage in life in which they experience increased autonomy, both in terms of availability of meals outside the home and discretionary income.[10,13] Multiple factors may influence consumption and purchasing decisions and studies among adolescents suggest that taste preferences, parental modelling, convenience, food availability and value may all play a role.[14,15] In order to develop effective interventions to reduce intakes of soft drink and fast food, a better understanding of the influences on consumption is needed.

The aim of this paper was to examine the associations

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between personal, social and environmental factors and adolescents' consumption of fast foods and soft drinks. A secondary aim was to examine whether these associations varied according to age and sex.

MATERIAL AND METHODS

Data for this study were derived from the New South Wales (NSW) Schools Physical Activity and Nutrition Survey, 2004 (SPANS 2004). The methods employed in SPANS 2004 have been described in detail elsewhere.[16] SPANS 2004 was a representative population survey of students attending Grades 6, 8 and 10 in primary and secondary schools in NSW, Australia. Data were collected from February through May 2004.

Procedures

An 88 item self-report questionnaire on dietary habits and food intake was developed for SPANS and administered by the research team to students in Grades 6, 8 and 10 who were seated at individual desks in classrooms. While completing the first five questions, students were shown food models to assist them in determining serving size. In particular, three widely available types of soft drink containers (a standard Australian 375 ml can, a 330 ml bottle and a 600 ml bottle) were shown to assist students to determine their usual daily consumption. Students were then instructed to work through the questions at their own pace. Students were told to raise their hand to indicate when they had finished and their questionnaires were checked for missing responses.

Measures

Soft drink and fast food intake: Students were asked to report the quantity of soft drink usually consumed each day, using the categories: "I don't drink soft drink", "Less than 250 ml", "Between 250 and 400 ml", "Between 400 ml and 1 Litre" and "More than 1 Litre". They were also asked "how many days each week do you usually eat food from a fast food outlet (like McDonalds, KFC, Burger King): "Never or rarely", "Less than once/week", "About 1-3 times/week", "About 4-6 times/week" and "Every day".

Influences on intake: Students were asked to indicate whether they "strongly agreed", "agreed", "neither agreed nor disagreed", "disagreed" or "strongly disagreed" with each of 12 statements that examined influences on soft drink consumption and 12 statements that examined influences on fast food consumption. These items were informed by a review of the literature, as well as the Social Learning Theory, which has been shown to be useful in understanding influences on food intake. [14,19,20, 21,22] Five questions examined personal influences, two questions examined social influences and the remaining five questions examined environmental influences (see Table 3).

Data analysis

Data were analysed using SAS/STAT software, Version 9.1 of the SAS System for Windows. The number and proportion of students agreeing to attitudinal questions were tabulated separately for boys and girls by grade. Soft drink consumption was dichotomised into greater than or equal to 250 ml/day or less than 250 ml/day. Fast food was dichotomised into consumption once or more per week, and consumption less than once/week. Associations between attitudes and consumption were assessed using multiple logistic regression, adjusted for the stratified and clustered nature of the survey design (each school being the unit of cluster) using the SURVEYLOGISTIC procedure. Effect modification of grade and gender group on attitudes was assessed, and separate models were constructed for each level of any significant effect modifier. A backward elimination procedure was used to determine the attitudinal factors significantly associated with consumption.

RESULTS

Data were collected from students in Grade 6 (n=948, 49% male), Grade 8 (n=801, 51% male) and Grade 10 (n=970, 57% male), the mean ages of which were 11.3, 13.3 and 15.3 years, respectively.

Soft drink and fast food intakes

Daily soft drink consumption was more common in boys than girls, with over half of the boys in all Grades reporting than they drank at least 250 ml each day. Among Grade 6 students, 55.4% of boys and 37.0% of girls re-

Table 1. Percentage (%) of students responding that they agree or strongly agree to attitudinal variables influencing consumption of soft drink

Question	Grade 6		Grade 8		Grade 10	
	Boys	Girls	Boys	Girls	Boys	Girls
I usually choose soft drinks instead of water or milk (p)	23.1	17.8	26.4	21.1	25.0	21.9
I usually choose diet soft drinks (p)	24.3	19.0	16.0	18.9	9.4	15.9
Drinking soft drink makes me feel good (p)	25.9	14.1	28.5	14.5	27.3	10.9
Soft drinks are usually available in my home (e)	40.3	32.9	39.4	36.1	47.0	44.6
I usually drink soft drink with my meals at home (e)	26.0	19.2	21.4	19.3	25.6	18.1
I usually drink soft drink with lunch at school (e)	8.6	5.1	17.8	10.2	23.2	14.0
I drink the same soft drink as most of my friends (s)	31.7	24.2	34.5	29.3	38.2	26.6
I think everyone my age likes soft drink (s)	66.8	58.2	68.5	53.9	63.5	56.6
I choose the soft drink with the best TV ads (e)	12.9	7.8	6.9	3.1	5.2	1.9
I choose the soft drink with the best competitions/prizes (e)	13.1	7.6	8.4	5.9	12.3	2.7
Soft drinks are convenient to buy (p)	36.6	26.6	41.0	29.7	53.5	50.7
Soft drink is good value for money (p)	20.0	12.8	17.0	10.5	19.3	8.9

p=personal factor, s=social factor, e=environmental factor

ported daily consumption of at least 250 ml each day. For Grades 8 and 10, daily consumption of at least 250 ml of soft drink was reported by 57.4% of boys and 42.7% of girls and 55.0% of boys and 35.7% of girls respectively.

The prevalence of consumption of meals from fast food outlets at least once/week was also higher among boys than girls. Fast food consumption was highest among Grade 6 boys with 19.6% reporting weekly consumption while 15.7% of Grade 8 and 16.0% of Grade 10 boys also consumed fast food at least once per week. Among girls, Grade 10 students were most likely to report eating fast food at least once per week (14.0%) with 9.2% of Grade 8 and 10.2% of Grade 6 girls also reporting weekly consumption.

Influences on soft drink intake

The proportion of students who reported that they agreed or strongly agreed with each of the 12 statements regard-

Table 2. Factors associated with consumption of ≥ 250ml of soft drink daily

Question	Odds Ratio	95% CI	*p* value
Grade 6			
I usually choose soft drinks instead of water or milk	2.18	1.39, 3.43	0.0007
Drinking soft drink makes me feel good	1.65	1.05, 2.59	0.03
Soft drinks are usually available in my home	2.26	1.74, 2.93	<0.0001
I drink the same soft drink as most of my friends	1.96	1.43, 2.67	<0.0001
Soft drink is good value for money	1.55	1.05, 2.28	0.03
Grade 8			
Drinking soft drink makes me feel good	2.41	1.56, 3.71	<0.0001
Soft drinks are usually available in my home	3.29	2.10, 5.17	<0.0001
I usually drink soft drink with my meals at home	3.16	1.73, 5.75	0.0002
I usually drink soft drink with lunch at school	4.31	2.34, 7.93	<0.0001
Soft drink is good value for money	2.01	1.21, 3.35	0.007
Grade 10			
I usually choose soft drinks instead of water or milk	2.84	1.81, 4.44	<0.0001
Soft drinks are usually available in my home	2.21	1.53, 3.19	<0.0001
I usually drink soft drink with my meals at home	2.38	1.56, 3.64	<0.0001
I usually drink soft drink with lunch at school	2.38	1.50, 3.78	0.0002
I drink the same soft drink as most of my friends	1.47	1.08, 1.99	0.01

multiple logistic regression analysis adjusted for clustering, age and sex

Table 3. Factors associated with consumption of fast food more than once/week

Question	Odds Ratio	95% CI	*p* value
Grade 6 Boys			
At a fast food outlet, if I can "upsize" I usually do	3.2	2.2, 4.7	<0.0001
I prefer eating at a fast food outlet to eating at home	1.9	1.2, 3.0	0.009
Grade 6 Girls			
I go to fast food outlets because I like the taste of the food	2.5	1.3, 4.6	0.005
I prefer eating at a fast food outlet to eating at home	2.2	1.2, 4.1	0.01
Fast food is available whenever I want some	3.1	1.5, 6.4	0.002
I choose the fast food outlet with the coolest TV ads	3.5	1.3, 9,4	0.01
Grade 8 Boys			
I go to fast food outlets because I like the taste of the food	2.2	1.1, 4.4	0.03
I prefer eating at a fast food outlet to eating at home	2.7	1.5, 4.8	0.0006
Fast food is available whenever I want some	3.9	1.9, 7.7	0.0001
When I go to a fast food outlet, I usually choose the value meal	0.5	0.3, 0.9	0.03
Grade 8 Girls			
At a fast food outlet, if I can "upsize" I usually do	2.8	1.2, 6.4	0.02
I prefer eating at a fast food outlet to eating at home	3.3	1.4, 8.0	0.007
Grade 10 Boys			
I go to fast food outlets with my friends	2.1	1.1, 3.9	0.03
Fast food is available whenever I want some	1.8	1.1, 3.0	0.02
Fast food is good value for money	2.6	1.4, 4.8	0.002
I prefer eating at a fast food outlet to eating at home	1.7	1.1, 2.8	0.03
Grade 10 Girls			
At a fast food outlet, if I can "upsize" I usually do	2.0	1.2, 3.3	0.01
I go to fast food outlets because I like the taste of the food	2.5	1.1, 5.4	0.02
I prefer eating at a fast food outlet to eating at home	4.1	2.1, 8.0	<0.0001
Fast food is available whenever I want some	2.9	1.3, 6.3	0.008
I choose the fast food outlet with the coolest TV ads	5.0	2.1, 12.4	<0.0004

multiple logistic regression analysis adjusted for clustering, age and sex

ing soft drinks is shown in Table 1. Between one third and one half of adolescents reported that soft drink was usually available in their homes. Over half agreed that everyone their age liked soft drink and a similar proportion agreed that soft drink was convenient to buy. Almost one quarter of boys and one fifth of girls reported that they usually drank soft drink with their meals at home.

The results of the multivariable logistic regression analysis showing associations with daily soft drink consumption are presented in Table 2.

Among Grade 6 students, the likelihood of frequently consuming soft drink was greater among students who agreed they chose soft drink over water or milk, that soft drink made them feel good and that soft drink was good value for money. Frequent soft drink consumption was also greater among those who reported they drank the same soft drink as their friends. However, the availability of soft drink in the home demonstrated the strongest association with consumption in this age group, and was associated with consumption in both Grade 8 and 10 students.

Influences on fast food intake

Half of all students agreed that they liked the taste of fast food and that they go to fast food restaurants with their friends and family. Similar proportions of adolescents agreed that they chose "value" meals (with fried potato products and soft drinks) as those who agreed that they usually chose the low fat or healthy menu option. Models were constructed for each Grade group and gender to determine which factors were significantly associated with consumption of foods from fast food outlets. These factors are shown in Table 3.

Interpersonal and environmental factors were associated with consumption in each of the Grade and gender groups. In particular, the perception that fast food was readily available was significantly associated with consumption in all groups except Grade 6 boys and Grade 8 girls.

DISCUSSION

The aim of this study was to examine the associations between a range of personal, social and environmental factors and consumption of soft drink and fast food in adolescents. It presents the first data of this kind in a representative sample of over 2,700 adolescent boys and girls aged 11-16 in Australia. We found that over half of boys and more than one third of girls drank soft drink every day, and that between nine and twenty percent of students ate at a fast food outlet every week. It is noteworthy that over half of students agreed that soft drinks were popular among their peers and over one third agreed that they were always available to drink in their homes.

Soft drinks and fast food are typically energy dense and nutrient poor.[19,23] Soft drink consumption in particular has been associated with weight gain and obesity and high consumption will inevitably replace more nutritious beverages.[6,23] In this study, about one in four adolescents reported that they usually chose soft drinks instead of milk or water; potentially increasing risk of inadequate calcium intake, dental caries and excess caloric intake. Soft drink consumption with meals was common, with up to 25% of boys and around 20% of girls consuming soft drinks with dinner. This finding is of concern for two reasons; firstly, soft drinks must be readily available in the homes of these adolescents and if consumed with dinner, must be perceived as a normal and appropriate drink. Secondly, consumption of soft drink during dinner has the potential to displace more nutritious food and drinks.

One study in the US found that the availability of soft drinks at school was significantly associated with consumption.[15] Recently, the Governments of Australia's two most populated States (Victoria and New South Wales) have moved to ban soft drink sales in school canteens and vending machines in public schools, which should contribute to a reduction during school hours. A secondary impact may be that parents perceive that soft drinks should not be an integral part of the adolescent diet and change their purchasing decisions accordingly. The impact of the ban may be particularly important, as almost half of Grade 10 boys and girls in our study reported that soft drinks were usually available in their homes. Although adolescents are becoming more autonomous, parents are still primarily responsible for grocery purchases and could be encouraged to remove soft drinks from the home and to offer water or milk with meals rather than soft drinks. Adolescents generally have limited budgets and most did not agree that soft drink was good value for money.[14] Increasing the price of soft drinks may therefore have an effect on consumption in a similar manner as that found with tobacco products. Using an alternative approach, French et al (2004) found that reducing the price of nutritious food and drinks within the school food environment had a positive effect on consumption by secondary school students.[24]

Fast food consumption among the adolescents in our study was predominantly influenced by taste, convenience and value for money. Over half of boys and girls agreed that they went to fast food outlets because they liked the taste of the food, with this response being more common among boys in all Grade groups. Boys seem more likely to choose the food combinations offered by fast food outlets than girls in our study, with 41.9% of Grade 10 boys, but only 26.6% of girls agreeing that they usually chose the value (burger, chips and drink) meal, and 27.3% of boys, but only 14.0% of girls choosing the fast food outlet with the best value meals. Boys in all age groups were more likely to "upsize" their meal than were girls. These findings suggest that boys are more at risk of over consumption of high fat energy dense foods during adolescence than are girls. Health messages that specifically target boys may be needed to help reverse the perception that consuming large portions of fast food is desirable.

Among Grade 6 boys and Grade 8 and 10 girls, consumption of energy dense foods was significantly associated with choosing to "upsize" at fast food outlets. Upsized portions of fast food almost certainly contain more than an entire days worth of kilojoules and fat and may be contributing to obesity in this age group.[7] Fast food outlets should be encouraged to promote reasonable portions of more healthful food, remove the "super-size options and be prevented from operating school food services.

A limitation of our study is the use of self report instruments administered at a single time point. However

the large sample size of students at early, mid and late adolescence that is representative of the population provides insights into the differing influences at different stages of adolescence which may help to inform interventions aimed at reducing consumption of soft drink and fast food.

Multiple strategies are needed to curb the epidemic of obesity among adolescents and this study furthers the understanding of the influences of consumption of energy dense, nutrient poor foods. Understanding the influences over consumption may assist in developing interventions to replace soft drink and fast food with more nutritious food and drinks. Changing the food environment to limit the availability of soft drink in the home and at school, and increasing the cost of nutrient poor foods relative to nutrient rich food items would seem useful strategies. Similarly, policies to restrict the expansion of fast food outlets and encouraging outlets to provide healthy options at competitive prices that are targeted at young people may also prove effective strategies.

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AUTHOR DISCLOSURES

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青少年攝取軟性飲料和速食食品的影響因子

軟性飲料和速食食品是高能量密度的食品，並大力針對青少年的市場行銷，極有可能是造成肥胖風險的重要因子。本研究目的在探討青少年攝取軟性飲料和速食食品的影響因素，從 93 個在澳大利亞新南威爾斯省隨機選擇的學校，橫斷性調查 2719 位青少年（年齡 11-16 歲）。學生提供了關於軟性飲料和速食食品的攝取情形，並回答影響攝取的相關問題。超過一半的男孩和三分之一以上的女孩每天喝軟性飲料，而攝取高峰在 8 年級學生。四分之一的學生選擇軟性飲料替代水或牛奶，而大約 40%學生同意軟性飲料通常可在家中得到。在家中可得到和進餐時喝軟性飲料與所有年齡層軟性飲料的攝取有很密切的關聯。在所有年齡層，男孩攝取速食食品多於女孩。男孩中，便利性和物有所值與速食食品的攝取有最強的關聯；而女孩中，喜歡速食食品超過家中餐食及喜歡“升級”的餐點，與速食食品的攝取有強烈的關聯。若要減少軟性飲料的攝取，應針對家庭和學校環境，除去軟性飲料，以更營養的飲料替換。鼓勵速食餐廳提供多樣的健康與價格不高且份量合理的食品。

關鍵字：青少年、肥胖、速食食品、軟性飲料、體重增加