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Consumption of takeaway and fast food in a deprived inner London Borough: are they associated with childhood obesity?

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To cite: Patterson R, Risby A, Chan M-Y. Consumption of takeaway and fast food in a deprived inner London Borough: are they associated with childhood obesity? *BMJ Open* 2012;**2**:e000402. doi:10.1136/bmjopen-2011-000402

► Prepublication history for this paper is available online. To view this file please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2011-000402>).

Received 13 October 2011
Accepted 23 April 2012

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ABSTRACT

Objective: A major concern is the ubiquitous presence of fast food and takeaway outlets within easy walking distance of schools, particularly in the light of the increasing burden of childhood obesity. Here, the associations between the schoolchildren's weights, their consumption of fast food and takeaway outlets were examined in a deprived inner London Borough.

Design: This is a cross-sectional study.

Participants: 193 schoolchildren (aged between 11 and 14 years old) participated in this study.

Main outcome measures: Body mass index (BMI) percentiles specific for age and gender were obtained. Frequency of food and drinks purchased from fast food outlets and takeaway outlets over a weekly period and preferred types of drinks and food products usually consumed were measured.

Results: More than 50% of the children in our survey purchased food or drinks from fast food or takeaway outlets twice or more a week, with about 10% consuming fast food or drinks from these outlets daily. About 70% of these children from Black ethnic groups and 54% of Asians purchased fast food more than twice a week. BMI has a significantly inverse relationship to fast food consumption. However, when age and gender are accounted, the BMI age–gender percentile is no longer significantly related to fast food consumption.

Conclusions: This study revealed a very high frequency of fast food consumption among the schoolchildren. Taste, quick access and peer influence were major contributing factors. These schoolchildren are exposed to an obesogenic environment, and it is not surprising that in this situation, many of these children are already overweight and will likely become obese as adults.

Overweight children have increased risks of becoming obese adults and developing other chronic disease.¹ National statistics reveal that obesity levels among 11–15-year-old boys and girls are 19.7% and 15.4%, respectively.² Access to energy-dense high-fat and salty foods accompanied by sweetened soft drinks

ARTICLE SUMMARY

Article focus

- To investigate the use of fast food and takeaway outlets among schoolchildren in an inner London Borough, which has a high concentration of these outlets and a higher regional level of obesity levels among the children as compared with national levels.
- To examine the relationship between the schoolchildren's weight status and the various characteristics related to use of fast food outlets.

Key messages

- More than half of the children in our survey purchased food or drinks from fast food or takeaway outlets twice or more a week, with one in 10 of them consuming fast food or drinks from these outlets everyday.
- 70% of the children also preferred to buy sweetened soft drinks over other drinks when purchasing fast food.
- Prompt actions need to be taken to either limit the ability of these children to access fast food outlets or to change the foods or beverages they purchased at these outlets.

Strengths and limitations of this study

- The BMI age–gender percentiles of the children and fast food consumption was measured in a deprived area of inner London borough.
- Further studies with larger sample sizes are needed to further elucidate the relationship between the weight status, fast food consumption and the various socioeconomic factors influencing these children's purchase patterns.

on school campuses, at home and fast food outlets markedly increases children's energy intake that can lead to obesity. Findings have suggested that young people of adolescent age form a large percentage of consumers that use fast food outlets.^{3 4} Children ate three times more food from restaurant and fast food outlets now as compared with 30 years ago.⁵ This may be due to the relatively cheap, accessible fast food, food advertising and with both parents working so less time to cook for family.

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Fast food and childhood obesity

The fast food and takeaway market in UK is estimated to worth £8.9 billion in 2005 with predictions of 5% annual increments.⁶ Therefore, a major concern is the number of these outlets within easy walking distance of schools, particularly in the light of the increasing burden of childhood obesity.⁷ Though increased consumption of takeaway and fast food has been suggested to be responsible for the obesity epidemic,⁷ evidence for this linkage has been conflicting.^{8, 9} Additionally, there is limited published literature that is available reporting the use of fast food by children or adolescents within UK and the role it may play in contributing to childhood obesity.

A recent review⁹ reported that most of these studies were undertaken in the USA and only three studies were done in UK. Of these three studies, one was a study in Glasgow,¹⁰ while the other two were ecological studies.^{11, 12} Fraser and colleagues⁹ concluded from their review although there is a positive association between availability of fast food outlets and increasing deprivation, the association between availability of fast food outlets or the consumption of fast food and overweight/obesity status is less conclusive. However, findings from a recent study carried out on 3600 adolescents in UK suggested that those adolescents who ate at fast food outlets tend to consume more unhealthy foods and were likely to have higher weight status than those adolescents who did not consume fast food frequently.¹³

Therefore, the use of fast food outlets among schoolchildren in an inner London Borough, the relationship between their weight status and the various characteristics related to use of fast food outlets were examined. The survey was conducted in the inner London Borough of Tower Hamlets that has a high concentration of fast food outlets as well as a higher regional level of obesity levels among the children as compared with national levels.¹⁴

METHODS

Participants

Health coordinators in 11 state schools in Tower Hamlets, an inner London Borough, were invited via email and/or in person to take part in this study. Letters explaining the aims, objectives and details of the study were also provided to each school. Two schools agreed to participate in the study. Both schools operate an open gate policy during the lunch break. A total of 193 pupils (females n=75, males n=108, gender not specified n=10) aged between 11 and 14 years were recruited. All the names of the participants were kept anonymous and were identified by assigned numbers (on the questionnaires). Data stored were anonymised, and participants were only identified by the assigned numbers. Ethical approval was obtained from London Metropolitan University Research Ethics Review Panel, London, UK.

Questionnaire

Construction of the questionnaire involved adapting questions from a review of existing literature that had

looked at the reasons behind children's purchases from fast food takeaway outlets.^{3, 4, 15, 16} Participants were asked to self-report their gender, age, date of birth and ethnicity. Ethnicity was based on a modified list from the Office for National Statistics 2001 census group classification of ethnicity.¹⁷ Free school meal entitlement was used as a proxy measure of deprivation in our survey, and it is also commonly used to investigate schoolchildren families' income level.^{3, 18} Participants were also asked how often they would purchase food/drinks from fast food takeaway outlet over a week period. Previous studies have also used this type of question to define frequency of fast food consumption.^{3, 4} Participants were asked to indicate what portion size of chips they would normally purchase. Participants were asked to rank their three most popular types of beverages they would normally purchase. Participants were also asked to report their average level of physical activity during weekends and weekdays on the same questionnaire. Response options include from <2 h, 2–5 h and 5 h or more per day.

A pilot study of the questionnaire was done with a small sample of pupils (n=30) aged 12–13 years. Suggestions from the pilot study included rewording the questions to be better understood and to restrict the number of open-ended questions. The questionnaire was distributed in both schools between February 2010 and March 2010 and was completed by 193 pupils. The questionnaire was designed to be self-administered. Trained research assistants were available to help students who needed help with understanding or reading the questions.

Anthropometry

Anthropometric measurements were collected by trained research assistants. Height was measured to the nearest millimetre using SECA Leicester portable height measure (stadiometer). All participants were instructed to remove their shoes before their height was taken and to align their head in the Frankfurt plane.¹⁹ Weight was measured to the nearest 0.1 kg using calibrated Weight Watchers Easy Read Precision electronic scales (model: 8961U). Participants were instructed to remove their shoes and outerwear, that is, outdoor jacket, and remain in their uniform before they were weighed. Self-reported measurements were excluded from the study data set as they were believed to be unreliable. Body mass index (BMI) was obtained from measured height and weight of the pupils and calculated using the following formulae: $BMI \text{ kg/m}^2 = \text{weight (kg)}/\text{height}^2 \text{ (metres)}$. BMI percentile for age and gender based on the validated UK 1990 reference data charts was calculated, taking into account date of birth and date of measurement.^{20–23} Percentile between 85th and 95th percentile was defined as overweight and ≥ 95 th percentile was defined as obese.^{24, 25} One hundred and twenty-one schoolchildren had completed data for calculation of BMI percentile for age and gender.

Statistical analysis

Data were analysed using SPSS V.18.02 (SPSS Inc.). Results shown are either presented as means \pm SD, median (range) or frequencies (percentages). Statistical significance was taken when the p value was ≤ 0.05 . Categorical variables were compared using the χ^2 test and continuous variables using the Kruskal–Wallis test.

RESULTS

The mean respondent age was 12.8 (range 11–14) years old and 56% of the respondents were male (table 1). The ethnic background of the study population was mainly Asians (48.3%) and Black/African-Caribbean (19.4%), reflecting the sampling region. Majority of the sampled population (61%) was entitled to free school meals. About one in three respondents (30.6%) was classified as being overweight or obese. Thirty-two per cent of the males were classified as being overweight or obese as compared with 29% of the females. About half of the sampled population (54%) reported that they usually purchased food or drinks from fast food or takeaway outlets more than two to three times a week. About half of the schoolchildren (48%) would spend $<£2$ per visit.

Although frequency of fast food consumption was not significantly related to gender, age or deprivation (proxy indicator used is the entitlement to free school meals), we observed that there is a trend that more males have fast food more often (>2 – 3 /times/week) than the females. There were no observable differences between those who are entitled to free school meal vouchers and

their frequency of consumption of fast food. We observed that the schoolchildren from the Asian and Black ethnic groups appeared to be more frequent consumers of fast food as compared with other ethnic groups. Up to almost 70% of the children from the Black ethnic groups and 54% of Asian youth purchased fast food more than twice a week. Table 2 shows that BMI has a significant inverse relationship to fast food consumption. However, when age and gender are accounted, the BMI age–gender percentile is no longer significantly related to fast food consumption. Based on our observations, it appears that those who have higher BMIs are less likely to consume fast food as often. Choice of the portion of chips usually purchased is significantly larger among those who consumed fast food more than four times per week (table 2). There is also a significant interaction between the choice of beverage and the frequency of fast food consumption. With greater frequency of consumption of fast food, more would choose a sweetened fizzy drink apart from the daily consumers of fast food who appeared to prefer diet or unsweetened drinks. Additionally, it was observed that a majority (about 70%) when asked to rate which type of beverages would they normally purchased reported fizzy sweetened drinks as their first choice.

Figure 1 shows the plot of percentage of respondents agreeing or disagreeing with reasons for why they have decided to buy food/drinks from the fast food and takeaway outlets against the frequency of consumption per week. Of the four statements, the only significant

Table 1 Demographics and characteristics of the surveyed population (n=193)

	Mean or %	SD	Minimum	Maximum
Age (years) (n=189)	12.8	0.8	11	14
Male (%) (n=183)	56			
Ethnicity (%) (n=187)				
White	21.1			
Asian (excluding Chinese)	48.3			
Black/African–Caribbean	19.4			
Others	11.1			
BMI (kg/m ²) (n=121)	20.8	4.2	14.0	36.4
BMI for age percentile				
Male (n=72)	61.9	31.5	1	100
Female (n=49)	64.0	27.3	1	100
% Overweight (by BMI for age specific for gender) (n=121)	9.1			
% Obese (by BMI for age specific for gender) (n=121)	21.5			
Entitlement to free school meals (%) (n=183)	61			
Weekly purchases at fast food outlets (%) (n=183)				
Everyday	9.8			
4–6 times	9.8			
2–3 times	34.4			
Once a week	27.9			
Less than once a week	18.1			
Amount spent per visit (%) (n=184)				
Less than £2	47.8			
£2–£3	25.5			
More than £3	26.6			

BMI, body mass index.

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Table 2 Characteristics associated with fast food use categorised by frequency of fast food consumption

	Everyday	4–6 times per week	2–3 times per week	Once a week	Less than once a week	Significance
Gender (%)						
Male	11	12	40	25	12	0.15
Female	8.2	6.8	28.8	34.2	21.9	
Age	12.5 (12–14)	13 (11–14)	13 (11–14)	12 (11–14)	13 (12–14)	0.51
BMI	17.8 (14–23)	18.3 (15–22)	19.6 (15–34)	20.3 (14–36)	21.4 (17–29)	0.01
BMI for age–gender percentile	41 (1–96)	55 (8–85)	62.5 (3–100)	76 (1–100)	74.5 (27–100)	0.15
Entitlement to free school meals (%)						
Yes	9.6	7.8	35.7	27.8	19.1	0.74
No	9.4	14.1	32.8	28.1	15.6	
Ethnicity (%)						
White	5.3	0	34.2	34.2	26.3	
Asian	12.6	11.5	29.9	26.4	19.5	0.28*
Black/African–Carribeans	8.6	14.3	45.7	25.7	5.7	
Others	5	15	35	30	15	
Level of physical activity (%)						
During weekdays						
<2 h	53.3	52.9	39.3	40.8	35.5	0.68
2–5 h	26.7	17.6	41.1	42.9	38.7	
>5 h	20.0	29.4	19.6	16.3	25.8	
During weekends						
<2 h	50.0	53.3	35.7	41.3	25.0	0.30*
2–5 h	21.4	6.7	33.9	30.4	46.9	
>5 h	28.6	40	30.4	28.3	28.1	
Choice of portion of chips						
% Of children choosing large portion	19.6	14.3	28.6	21.4	16.1	0.017
% Of children choosing small portion	5.8	6.7	36.7	32.5	18.3	
First choice of beverage						
% Of children choosing fizzy sweetened	44.4	88.9	73	68.6	51.5	0.007
% Of children choosing not sweetened	55.6	11.1	27	31.4	48.5	

*The χ^2 test result is not valid here because more than 20% of the squares have expected value less than 5 counts. Figures in parentheses denote the IQR.
BMI, body mass index.

relationship was found between the frequency of consumption and the percentage of respondents agreeing with the reason that they bought food or drinks as they wanted to join their friends. The biggest difference was observed among those who consumed fast food or drinks from the outlets two to three times per week. More than two-thirds of them agreed that they consumed these foods because of their peers. Interestingly, taste of the food was the most popular reason given by all respondents. Around 92% of the respondents agreed that they liked the taste of the food sold in fast food/takeaway outlets. Even for those who consumed fast food less than once a week, all of them agreed with this reason. It appears that those respondents who eat fast food everyday are less convinced about taste than the other frequency of consumption groups. It is possible that this particular group of respondents might feel less inclined to report their true attitudes towards their purchase of fast food patterns. Additionally, those

respondents who consume fast food everyday tend to be less influenced by the reasons (figure 1) as compared with the other groups.

The second most popular reason was the fact that they could purchase this food or beverages quickly. The schoolchildren, when asked to choose the factors which would motivate them to choose healthier food products at fast food and takeaway outlets, the most popular factor was to have better choice of products, followed by cheaper prices and chances to win prizes and to have a wider and better range of fruit (figure 2).

Levels of physical activity both during the weekdays and the weekend were not significantly related to fast food consumption. It was observed that among those children who consumed fast food more than four times per week, one in two spent <2 h doing physical activities both during the weekdays and weekends as compared with the other children who consumed fast food less frequently. Again, this trend was reflected in the level of physical

activity assessed during the weekend. Those who consumed fast food at least once a week were less active than those who consumed fast food less than once a week.

Gender differences

It was observed that there were significant differences between gender and practices related to fast food consumption. For example, there were significantly more females who would buy chips alone at fast food outlets as compared with males (figure 3). There is also a significant relationship between gender and the portion of chips normally bought at the fast food outlets. More males bought large portion of chips as compared with the females (figure 3). Although it appeared that there was a trend which showed that more males preferred to have fizzy sweetened drinks as compared with females, this does not reach statistical significance. There are more males than females who were classified as overweight or obese but this difference is not significant. There were significantly more females who tend to think a lot about being slimmer as compared with the males (figure 3).

DISCUSSION

More than half of the children in our survey purchased food or drinks from fast food or takeaway outlets twice or more a week, with one in 10 of them consuming fast

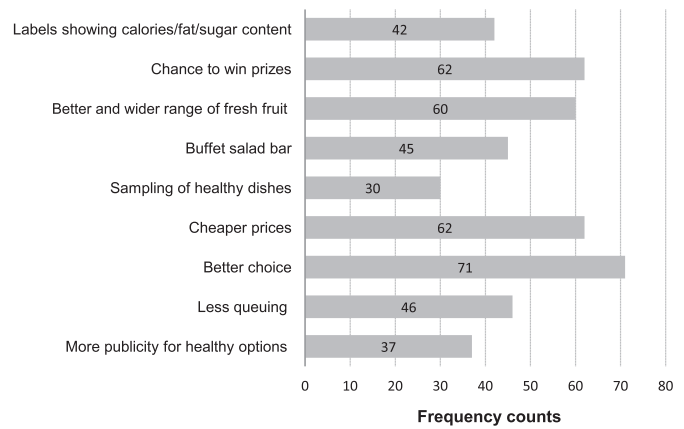


Figure 2 Factors that motivate young children to choose healthy foods at fast food/takeaway outlets.

food or drinks from these outlets everyday. A previous study has shown that there are more than 40 fast food outlets in close proximity to each school in Tower Hamlets.¹⁴ Furthermore, 97% of residents in the borough of Tower Hamlets were found to live within 10 min of a fast food outlet.²⁶ It is likely that such easy access could influence the schoolchildren's fast food consumption, in addition to the low cost of this type of food (average amount spent by each child is £2 per visit).

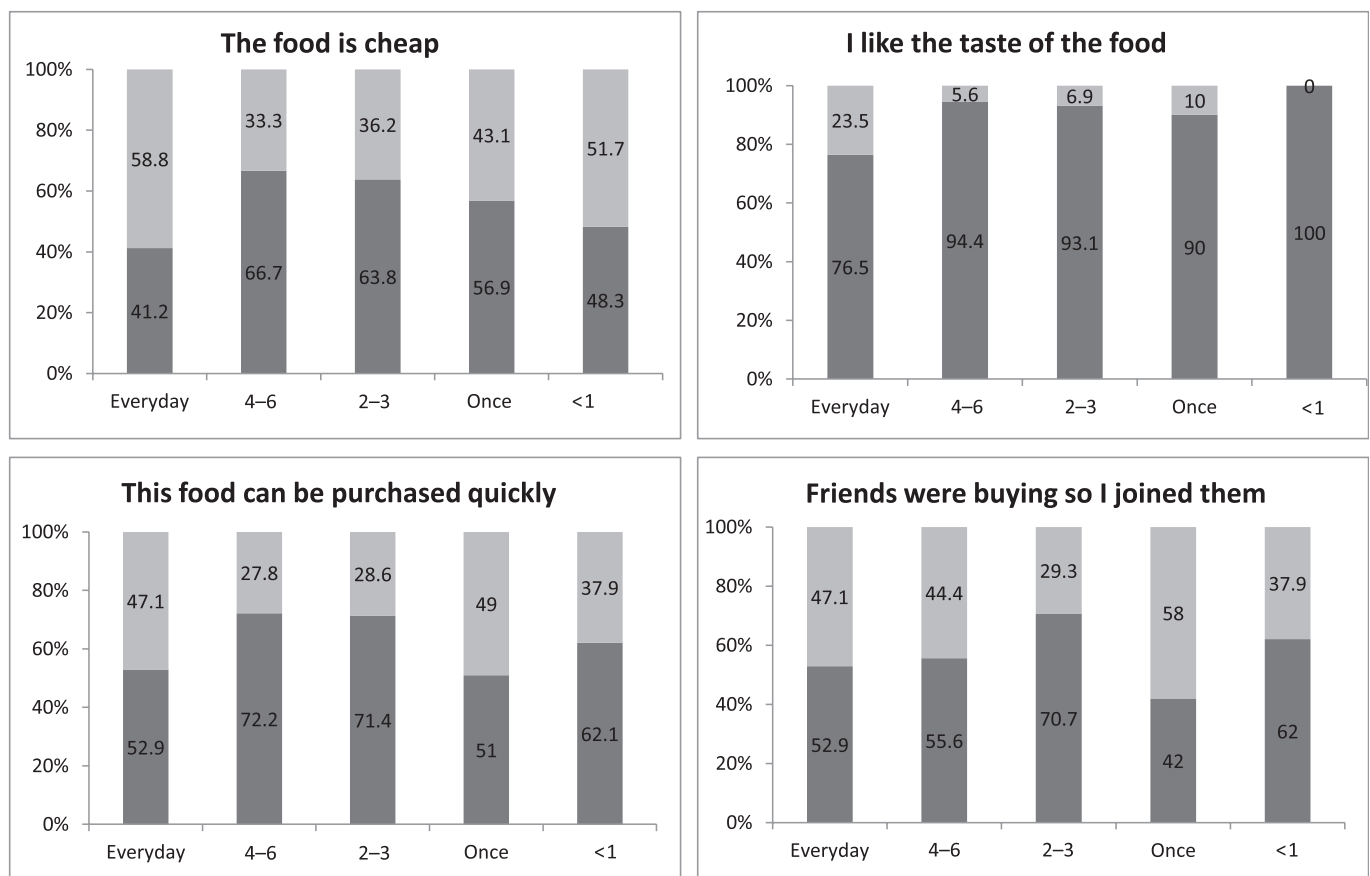


Figure 1 Plot of percentage of children agreeing (dark columns) and disagreeing (pale columns) with the statements providing reasons for why they have decided to buy food/drinks from the fast food and takeaway outlets against the frequency of consumption per week.

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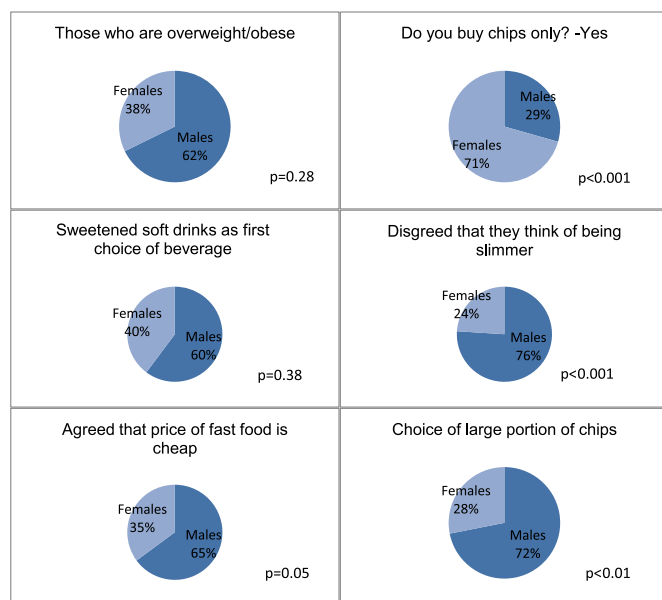


Figure 3 A comparison between genders with characteristics associated with fast food consumption.

Our results showed that chips were frequently purchased either on their own or purchased with other fried items like fried chicken or pizzas. In addition, a majority of these children (70%) also preferred sweetened soft drinks over other drinks when purchasing fast food. These products that are purchased are calorie dense, high in sugar, salt and fat as well as saturated fat (and probably trans fat). These products give no feeling of satiation, and their high salt content makes children thirsty and resulting in the children consuming more sweetened soft drinks. It is perhaps not surprising that many of these children were already overweight and will become obese as adults. About one in three of our sampled population was overweight or obese. Local statistics²⁷ have shown that obesity levels among 10–11 years old in Tower Hamlets are around 26% as compared with England's average of 19% in 2011.

In addition, these children surveyed in this study did little exercise, and there was a non-significant trend of increased fast food consumption with lower physical activity levels. It was observed that those children who consumed fast food more than four times per week preferred larger portions of chips, resulting in greater calorie intake that could subsequently lead to further weight gain.

In spite of the above findings, there was no significant association between increasing takeaway and fast food consumption and obesity as measured by BMI corrected for age and gender. This is not a new finding. For example, French and colleagues³ found no significant relationship between frequent consumption of fast food and being overweight in their analysis of a cohort of 11–18-year-old boys and girls. Similarly, Simmons *et al*⁸ found no correlation between increasing takeaway consumption and obesity measured by either BMI or waist circumference.

Interestingly, it was observed that there was a significant trend that those who with greater BMIs reported purchasing fast food less often. However, this observation did not reach statistical significance when we corrected for age and gender. One possible explanation maybe that our respondents were under-reporting the amount of times they consumed fast food particularly if they were already overweight or obese. On the other hand, those who were already overweight could be trying to cut back on fast food consumption in order to lose weight. In support of this possible explanation, we observed that those who purchased fast food daily also preferred to purchase diet drinks over sweetened drinks and this might highlight the children's motivation to cut back on calories in order to lose weight.

Livingstone *et al*²⁸ also reported that those who are overweight or obese may decide not to frequent fast food outlets as often. Others have also reported similar observations among adolescents.^{29–30} Laska *et al*³⁰ found that BMI Z-score or percentage body fat was significantly lower among those who were closest to fast food outlets (within 800 m of their school).

As can be seen from [table 2](#), it was observed that there was a non-significant trend that schoolchildren from the two ethnic groups—Blacks and Asians—tend to have higher consumption of fast food. This could be of potential importance to public health, especially as these two ethnic groups have higher risks of developing cardiovascular disease and diabetes as adults.

As adolescents have increased independence over dietary choices and how to spend their money, it was of some interest to look at possible underlying reasons for why they purchased food or drinks from fast food or takeaway outlets. Our data suggest that peer influence is a significant and potentially important factor that influenced the frequency of consumption. Taste and quick access were the other two most popular cited reasons. A previous report also found that consumers of fast food reported that they enjoyed the taste of fast food.³¹ Taste may be related to the high-fat and salt content of these fast food products.

Males were less concerned about their weight and they would usually buy greater portions of chips and sweetened beverages as compared with the females. Significantly, more males agreed (62%) that they bought food from the takeaway/fast food outlets because they felt that the food was cheap as compared with the females (47%). The fact that females were more likely to buy chips only from takeaway/fast food outlets may also be due to the same perception over the pricing of fast food.

Strengths of the current study included the measurement of the BMI age–gender percentiles of the children and use of an ethnically diverse population representative of the resident population in a deprived area of inner London borough. A limitation of the study was the use of self-reporting of fast food consumption and physical activity level in this population. While this approach has also been used in other studies,⁴ it is possible that peer influence or under-reporting

information may add to challenges of accurately assessing fast food intake in children. One other possible limitation was that some of those children who declined to be weighed might have been heavier than those children who agreed to take part in the study.

In summary, our study revealed that there was a very high frequency of fast food consumption for the majority of schoolchildren in Tower Hamlets. Frequent consumers preferred to buy sweetened soft drinks (not diet versions). This means that they are consuming a very high level of calorie intake with little or no feeling of satiation. Taste, quick access and peer influence were major contributing factors to them visiting fast food and takeaway outlets. Another worrying observation is that the majority of these frequent consumers were from ethnic backgrounds that are genetically predisposed to higher level of cardiovascular disease and diabetes. These schoolchildren are exposed to an environment that is likely to cause obesity, and it is not surprising that in this situation, many of these children are already overweight or obese and will likely become obese as adults. Clearly, actions need to be taken to either limit the ability of these children to access fast food outlets or to change the foods they purchased at these outlets (eg, less calorie dense, with more fruit and vegetables, with less fat and salt) and to have a ban on the sale of sweetened soft drinks at these outlets. Indeed, these schoolchildren were positive to modifications and may well choose healthier options if they were made easily available.

Acknowledgements The authors would like to thank Mr Simon Doff and Ms Seema Patel for assisting with the data collection.

Contributors At the time of the data collection, all authors were with London Metropolitan University. M-YC conceived and designed the study. RP and AR recruited the sample and collected the data. All authors analysed and interpreted the data. RP and M-YC wrote the manuscript, edited and approved the final version for submission.

Funding This research was funded by NHS Tower Hamlets.

Competing interests All authors have completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author M-YC) and declare no financial relationships with any organisations that might have an interest in the submitted work.

Ethics approval Ethics approval was provided by London Metropolitan University Research Ethics Panel.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional data available.

REFERENCES

- Rosenheck R. Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obes Rev* 2008;9:535–47.
- NHS Information Centre for Health and Social Care. *Statistics On Obesity, Physical Activity and Diet: England 2011*. <http://www.ic.nhs.uk> (accessed 2 May 2011).
- French SA, Story M, Neumark-Sztainer D, et al. Fast food restaurant use among adolescents associations with nutrient intake, food choices and behavioural and psychosocial variables. *Int J Obes Relat Metab Disord* 2001;25:1823–33.
- Bauer KW, Larson NI, Nelson MC, et al. Socio-environmental, personal and behavioural predictors of fast food intake among adolescents. *Public Health Nutr* 2008;12:1767–74.
- St-Onge MP, Keller KL, Heymsfield SB. Changes in childhood food consumption patterns: a cause for concern in light of increasing body weights. *Am J Clin Nutr* 2003;78:1068–73.
- Keynote 2006. *UK Fast Food and Home Delivery Outlets*. <http://www.reportlinker.com/p040211/UK-Fast-Food-and-Home-Delivery-Outlets.html> (accessed 2 Jun 2010).
- Schlusser E. *Fast Food Nation*. London, UK: Penguin, 2002.
- Simmons D, McKenzie A, Eaton S, et al. Choice and availability of takeaway and restaurant food is not related to the prevalence of adult obesity in rural communities in Australia. *Int J Obes (Lond)* 2005;29:703–10.
- Fraser LK, Edwards KL, Cade J, et al. The geography of Fast Food outlets: a review. *Int J Environ Res Public Health* 2010;7:2290–308.
- Macintyre S, McKay L, Cummins S, et al. Out-of-home food outlets and area deprivation: case study in Glasgow; UK. *J Behav Nutr Phys Act* 2005;2:16–22.
- Cummins S, McKay L, Macintyre S. McDonald's restaurants and neighbourhood deprivation in Scotland and England. *Am J Prev Med* 2005;29:308–10.
- MacDonald L, Cummins S, Macintyre S. Neighbourhood fast food environment and area deprivation—substitution or concentration? *Appetite* 2007;49:251–4.
- Fraser LK, Edwards KL, Cade JE, et al. Fast food, other food choices and body mass index in teenagers in the United Kingdom (ALSPAC): a structural equation modelling approach. *Int J Obes (Lond)* 2011;35:1325–30.
- Lloyd S, Madelin T, Caraher M. *The School Foodshed: A Report On Schools and Fast Food Outlets (FFOs) in Tower Hamlets 2010*. <http://www.foodvision.gov.uk/pages/tower-hamlets-food-for-health-award-scheme> (accessed 1 Jun 2010).
- Potischman N, Cohen BE, Picciano MF. Dietary recommendations and identified research needs for the national children's study. *J Nutr* 2006;136:686–389.
- Nelson MC, Lytle LA. Development and evaluation of a brief screener to estimate fast food and beverage consumption among adolescents. *J Am Diet Assoc* 2009;109:730–4.
- Office for National Statistics. *Ethnic Group Statistics: A Guide for the Collection and Classification of Ethnicity Data 2009*. <http://www.ons.gov.uk/about-statistics/measuring-equality/ethnic-group-statistics/ethnic-group-statistics-a-guide-for-the-collection-and-classification-of-ethnicity-data.pdf> (accessed 4 Feb 2010).
- Hobbs G, Vignoles A. Is children's free school meal eligibility a good proxy for family income? *Br Educ Res J* 2009;36:673–90.
- Gibson RS. *Principles of Nutritional Assessment*. 2nd edn. Oxford: Oxford University Press, 2005.
- Cole TJ, Freeman JV, Preece MA. Body mass index reference curves for the UK, 1990. *Arch Dis Child* 1995;73:25–9.
- Wright CM, Booth IW, Buckler JM, et al. Growth reference charts for use in the UK. *Arch Dis Child* 2002;86:11–14.
- NHS Choices. *NHS Choices Your Health, Your Choices 2010: Healthy Weight Calculator*. <http://www.nhs.uk/Tools/Pages/Healthyweightcalculator.aspx> (accessed 21 May 2010).
- Harlow Healthcare. *Child Growth Foundation—Health for All Children BMI Calculator*. 2010. <http://www.healthforallchildren.co.uk/?SHOP=HFAC4&DO=USERPAGE&PAGE=CALCULATOR> (accessed 7 Apr 2010).
- National Institute for Health and Clinical Excellence—Clinical Guideline no: 43 *Quick Reference Guide - Obesity Guidance on the Prevention, Identification, Assessment and Management of Overweight and Obesity in Adults and Children 2006*. <http://www.nice.org.uk/nicemedia/pdf/CG43quickrefguide2.pdf> (accessed 5 Apr 2010).
- Reilly JJ. Obesity in childhood and adolescence: evidence based clinical and public health perspectives. *Postgrad Med J* 2006;82:429–37.
- NHS Tower Hamlets. *Time For Health: The Annual Report of the Joint Director of Public Health 2008-2009*. <http://www.towerhamlets.nhs.uk/publications/corporate-publications/?entryid4=23516&q=0%ac2%acpublic%ac2%ac> (accessed 6 Jun 2010).
- Department of Health. *Health Profile 2011- Tower Hamlets*. <http://www.apho.org.uk> (accessed 15 Jun 2011).
- Livingstone MB, Robson PJ, Wallace JM. Issues in dietary intake assessment of children and adolescents. *Br J Nutr* 2004;92(Suppl 2):S213–22.
- Sturm R, Datar A. Body mass index in elementary school children, metropolitan area food prices and food outlet density. *Public Health* 2005;119:1059–68.
- Laska MN, Hearst MO, Forsyth A, et al. Neighbourhood food environments: are they associated with adolescent dietary intake, food purchases and weight status? *Public Health Nutr* 2010;13:1757–63.
- Winkler JT, Sinclair S. *The School Fringe: What Pupils Buy and Eat from Shops Surrounding Secondary Schools, 2008 Nutrition Policy Unit, London Metropolitan*. http://www.londonmet.ac.uk/londonmet/library/w47671_3.pdf (accessed 26 Feb 2010).

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