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‘Adolescents’ non-core food intake: A description of what, where and with whom adolescents consume non-core foods.’

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‘Adolescents’ eating context of non-core foods’

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## **Abstract**

**Objective:** Little is known about adolescents' non-core food intake in the UK and the eating context in which they consume non-core foods. This study aims to describe types of non-core foods consumed by British adolescents in total and across different eating contexts.

**Design:** This is a descriptive analysis, using cross-sectional data from the UK National Diet and Nutrition Survey 2008-2011.

**Setting:** Data from food diaries were used from 666 adolescents across the UK aged 11-18 years old. Non-core foods were classified based on cut off points of fat and sugar from the Australian Guide to Healthy Eating. Eating context was defined as 'where' and 'with whom' adolescents consumed each food. Percentages of non-core kcal were calculated for each food group in total and across eating contexts. A combined ranking was then created to account for a food's contribution to non-core energy intake and its popularity of consumption (% of consumers).

**Results:** Non-core food comprised 39.5% of total energy intake and was mostly 'Regular soft drinks', 'Crisps & savoury snacks', 'Chips & potato products', 'Chocolate' and 'Biscuits'. Adolescents ate 57% and 51.3% non-core food at 'Eateries' or with 'Friends', compared to 33.2% and 31.2% at 'Home' or with 'Parents'. Persistent foods consumed across eating contexts were 'Regular soft drinks' and 'Chips & potato products'.

**Conclusions:** Regular soft drinks contribute the most energy and are the most popular non-core food consumed by adolescents regardless of context and represent a good target for interventions to reduce non-core food consumption.

**Keywords:** non-core foods, adolescents, eating context, regular soft drinks

## Introduction

According to the Health Survey for England 2011, 24% of boys and 17% of girls aged 11-15 years old were classified as obese <sup>(1)</sup>. Obesity in adolescence has been associated with an increased risk of chronic disease, persisting through to adulthood <sup>(2)</sup>. One of the factors proposed to contribute to the obesity epidemic is the consumption of nutrient-poor foods <sup>(3)</sup>. Terms for a nutrient-poor food are inconsistent, varying from energy-dense, to empty calories, to low-nutrient-dense foods, to junk foods and so forth <sup>(4)</sup>. Definitions also vary across countries, organisations and health outcomes and are based on an unspecified nutrient density <sup>(5)</sup>, unspecified dietary guidelines or unexplained results from epidemiological studies <sup>(6)</sup>. A standardised approach with explicit criteria is required to define foods required for health.

The Australian Guide to Healthy Eating (AGHE) <sup>(7)</sup> divides foods into core, which should adequately provide the body with all the essential nutrients required, and non-core, which are surplus to requirements. Core foods form the five food groups of fruit, vegetables, cereals, meat and alternatives, milk and alternatives and ‘extra’ or non-core foods are everything else. This classification of foods to core and non-core is based on clearly defined cut-off points of fat and sugar derived from dietary guidelines and therefore presents a simple and explicit tool for defining ‘healthy’ and ‘unhealthy foods’ <sup>(8,9)</sup>.

Research into adolescents’ consumption of core and non-core foods has mainly taken place in Australia <sup>(8-10)</sup>. Non-core foods were found to contribute 40.9% energy, 47.3% total fat and 53.8% sugar to the total diet of children between 2-18 years old, with proportions increasing with age <sup>(8,9)</sup>. In the UK non-core food intake has not specifically been explored, however, carbonated and soft drinks were the most common snack consumed by 13-16 year old adolescents <sup>(11)</sup>. Although foods consumed as snacks can often be nutrient poor, the above study only used the time of day to identify snacks and hence the quality of the foods consumed at other times of day was not assessed. Another study using data from the UK 2008-2011 National Diet and Nutrition Survey (NDNS), found the most energy-dense foods consumed by 11-18 year old adolescents were fat oils and spread, sweet spreads, crisps and savoury snacks, nuts and seeds, chocolate confectionery and biscuits <sup>(12)</sup>. While the identification of foods according to their energy density is an indicator of the foods’ nutritional quality, it is not the only relevant factor and may misclassify certain groups, i.e. nuts and seeds, which are high in energy but are also a good source of unsaturated fats and vitamins.

In the UK, no study to date has described adolescents’ non-core food intake in terms of either the amount or types of non-core foods eaten, but this information could guide public

health initiatives aiming to improve adolescents' diet. In addition to identifying common non-core foods as targets for intervention, knowing the determinants of non-core food is crucial for designing effective strategies. Studies in younger children have shown that non-core food is associated with maternal intake of non-core food, home food availability and greater TV watching<sup>(13, 14)</sup>. However, adolescents are more likely to eat outside of the home and evidence suggests that friends have an increasing influence on food intake<sup>(15, 16)</sup>. There is some evidence that food provided from outside of the home is more likely to be a type of non-core food, for example, a recent study conducted in the US using the National Health and Nutrition Examination Survey (NHANES) data from 3,077 children and adolescents aged 2-18 years old reported that contribution of 'empty calories' (sum of calories from added sugar and fat) to the total energy intake was similar across stores, school and fast food places (33%, 32% and 35% respectively,  $p < 0.05$ )<sup>(17)</sup>.

Only one study has described adolescents' (11-13 years old) food consumption across different social contexts, e.g. alone, with family and with friends, however that was only assessed for the lunchtime period<sup>(18)</sup>. Although this study indicated potential food sources in different social contexts, the quality of these foods was not reported and subsequently the impact of social context on non-core food intake remains unclear. Experimental studies exploring food selection in the company of parents and friends, showed adolescent girls' higher consumption of unhealthy snacks (chips, cakes, cookies) in the presence of their mother compared to the company of a friend<sup>(19)</sup>, in addition eating with unfamiliar peers was associated with adolescent's having a higher healthy food intake (carrots, grapes)<sup>(20)</sup>. Using a social network approach Feunekes and colleagues found that consumption of foods like pizza, minced meat, bacon and fish fingers was highly correlated between parents and 15-year old adolescents, while consumption between adolescents and their friends was different i.e. spirits, breads, croquettes, fries and sausages<sup>(21)</sup>.

Little is known about adolescents' non-core food intake in the UK in terms of the contribution to total energy intake and the types of non-core foods being consumed overall and in different eating contexts. Therefore, this study aims to describe adolescents' non-core food intake in the UK and also explore variation in non-core food intake in different physical and social eating contexts.

## **Methods**

### **Study sample and design**

Dietary data were used from 666 adolescents aged 11-18 years old from Years 1-3 (2008/09 – 2010/11) of the UK National Diet and Nutrition Survey (NDNS). NDNS is a programme of cross-sectional surveys that assess the dietary intake and nutritional status of the general UK population aged 1.5 years and over. The sample is drawn from a selection of postcodes across the UK, which are then divided into smaller geographical areas called Primary Sampling Units (PSUs). A number of random households per PSU are then visited by the study team, where only 1 adult (19 years and over) and 1 child (1.5 to 18 years) can participate from the selected households. In order to have equal numbers of children and adults, in some households only children were selected to take part. A face-to-face interview is conducted and participants are asked to complete a food diary recording foods and beverages consumed inside and outside of the house over 4 consecutive days, randomly chosen. Participants who recorded at least 3 days were considered to have valid data. Portion sizes were estimated with household measures, while food weights from labels were also used for ready-made foods. More details about the design and dietary assessment of NDNS can be found elsewhere <sup>(22)</sup>. The NDNS was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Oxfordshire A Research Ethics Committee. Written informed consent was obtained from all participants <sup>(22)</sup>. The data for this secondary analysis was downloaded from <http://discover.ukdataservice.ac.uk/catalogue?sn=6533> (access date June 2012).

### **Classification of foods to non-core**

Food intake in NDNS consists of 60 main food groups, 150 subgroups and 3398 food items <sup>(23)</sup>. Classification of foods and food groups to non-core was made by using specific cut off points based on sample foods from the AGHE <sup>(7)</sup>. The cut off points are based on the amount of fat and sugar contained per 100 g of food and are different for each food group, taking into account differences in nutrient density <sup>(24)</sup>. If a food item exceeded the cut off points, it was then allocated to the non-core food group. The fat and sugar content of all foods items was examined, which allowed some main food groups to be wholly classified as core or non-core. If the allocation of a main group was not possible then sub-groups were allocated wholly and where this was not possible single food items were allocated as core or non-core individually. As an example, most types of cheese were allocated as core foods, however high fat content cheese such as stilton were allocated to the non-core food group whereas mozzarella type cheese was allocated to core foods. Composite dishes were examined as part of the main food group they were previously allocated in NDNS <sup>(23)</sup>. In case that foods had slightly different

content of fat and sugar, which would allocate them to a different group to what they have been allocated by Rangan et al. (2008) <sup>(24)</sup>, then Rangan and colleagues' allocation was taken into account. For example, coleslaw is considered a core food in Australia based on a fat content of 10-12%. However, although the coleslaw in NDNS has a fat content of 16% it was still allocated as a core food item. A total of 18 non-core and 17 mixed main food groups were determined, in which core and non-core food items were identified and grouped thus resulting in 20 groups of non-core foods (Supplementary Table 1). Although both food and beverage groups were analysed in this study, the term 'foods' is used throughout this study to comprise of foods and beverages, in order to ensure an easier reading flow.

### **Definition of eating context**

Participants in NDNS recorded 'where' and 'with whom' consumption of each food item occurred, which defined the eating context. In NDNS, 'where' responses were coded to 36 responses, which were then grouped to 7 categories for the purposes of the present study. Similarly, 'with whom' responses were initially coded to 18 responses, which were then grouped to 5 categories as part of the present study. Grouping happened with similar locations and people, for example 'school – canteen', 'school – classroom' and 'school – playground' would be grouped together under the category of 'School' and 'family', 'family & friends' and 'carers & other children' would be grouped together under 'Family & friends'. Also, categories that included only a few participants, were incorporated into other groups e.g. 'Partner', 'Partner with children' was added to the 'Friends' group. The initial 'where' and 'with whom' categories and their breakdown can be seen in Supplementary Table 2 and 3. In total, 12 eating contexts were considered for this analyses, i.e. 7 'where' and 5 'with whom' eating contexts.

### **Data analysis**

All descriptive analysis of non-core food consumption in total and across eating contexts (7 'where' and 5 'with whom' categories) was conducted in Stata Statistical Software: Release 13 (College Station, TX: StataCorp LP). Descriptives of non-core foods were produced according to age, gender and socioeconomic status (SES). SES (low, intermediate, high) was calculated from the National Statistics Socioeconomic Class (NS-SEC), which is based on occupation, as done elsewhere <sup>(25)</sup>. Percentages of non-core calories (kcal) consumed in total and across each eating context were calculated, by adding all individual intakes together to compute total non-core kcal consumed in the whole survey, in each context and for each food group separately. The term 'total/non-core kcal' refers to dietary energy from foods and beverages consumed in

the survey. Working with eating context means that the same adolescents can consume non-core foods in multiple different ‘where’ and ‘with whom’ categories, therefore exclusive percentages of non-core kcal cannot be generated. Hence, the dataset was re-structured and percentages of non-core kcal were calculated across the entire survey without taking into account the number of people. Percentages were calculated in order to meet 3 aims:

***Assessing total and non-core food consumption (in total and for each eating context)***

Percentages of total kcal consumed in each eating context were calculated by dividing the amount of kcal consumed in each of these eating contexts with the total kcal consumed in the entire survey and then multiplying it by 100. Similarly, to assess non-core food consumption in total, the amount of non-core kcal consumed in the entire survey was divided by the total amount of kcal consumed in the entire survey and then multiplied by 100. Percentages of non-core kcal consumed in each eating context out of the total kcal consumed in that context were also calculated. For example, to calculate the percentage of non-core kcal consumed with ‘Parents/Carers’, non-core kcal consumed with ‘Parents/Carers’ were divided by the total amount of kcal consumed with ‘Parents/Carers’ and then multiplied by 100.

***Assessing contribution of non-core foods to non-core food intake (in total and for each eating context)***

Percentages of non-core kcal from individual food groups were calculated to assess the types of non-core foods that contribute the most kcal to total non-core food intake. As an example, to calculate the percentage of non-core kcal contributed from ‘Crisps and savoury snacks’, the total amount of non-core kcal consumed from ‘Crisps and savoury snacks’ was divided by the total non-core kcal in the entire survey and then multiplied by 100. This process was replicated across all eating contexts to assess contribution of non-core foods within each setting i.e. contribution of ‘Crisps and savoury snacks’ at ‘Home’, with the difference that the denominator was the total amount of non-core kcal consumed in each of these settings. Percentages of the top 5 non-core foods’ contribution to non-core food intake (in total and for each eating context) are presented in Supplementary Table 4 and 5.

***Assessing popularity of non-core foods’ consumption (in total and for each eating context)***

Although it is important to assess caloric contribution of non-core foods to total non-core food intake, it is also important to understand how many people consumed these non-core foods in the survey. From a public health perspective, foods contributing a large amount of non-core



kcal to non-core food intake but consumed by only a few people may be less important than foods contributing medium amount of non-core kcal but eaten by many people. Hence, percentages of people consuming each non-core food were calculated by dividing the number of people consuming each individual food by the total number of people in the survey and then multiplying it by 100. The process was replicated across eating contexts, to assess popularity of non-core foods within each eating context, i.e. percentage of people consuming 'Biscuits' at 'School', with the difference that the denominator was the number of people consuming non-core foods in each of these settings. Percentages of the top 5 non-core foods' popularity among adolescents (in total and for each eating context) are presented in Supplementary Table 4 and 5.

### **Combined ranking of non-core food groups**

After assessing each food's contribution to total non-core food intake and the food's popularity, a combined ranking for each food group was created to account for both these aspects. Firstly, percentages of non-core kcal for all food groups in total were ranked from the non-core food contributing the most non-core kcal (rank=1) to the one contributing the least non-core kcal (rank=20). Secondly, percentages of people consuming each non-core food group in total were ranked from the most popular food (rank=1) to the least popular one (rank=20). Hence, two separate rankings were created for each food group that were then added to create a combined ranking. For example, if a non-core food group received a ranking of 3 for the amount of non-core kcal it contributes to total non-core food intake and a ranking of 5 for its popularity, it would get a combined ranking of 8. This process was replicated for each eating context separately. In the results the top 5 foods in total and for each eating context are reported based on the combined ranking.

## **Results**

### **Overall non-core food intake**

The percentage of non-core kcal consumed overall in the survey was 39.5% (Table 1). The mean non-core food intake according to age, gender and SES is presented in Table 2. Non-core food intake increased in mid-adolescence (13-15 years old) and then slightly dropped for the older age group (40.6% vs. 39.5%). Girls' non-core food intake was higher compared to boys (40.6% vs. 38.7%), while adolescents from low SES had the highest non-core food intake compared to higher SES groups (43.4% vs. 38.4%). Looking at the top 5 foods that contributed

the most non-core kcal to total non-core food intake and were also popular among adolescents were ‘Regular soft drinks’, ‘Crisps & savoury snacks’, ‘Chips & potato products’, ‘Chocolate’ and ‘Biscuits’ (Table 3).

### **Non-core food intake across the ‘where’ eating contexts**

Table 1 shows percentages of total and non-core kcal consumed in each location. Overall nearly two thirds of total energy intake was consumed at ‘Home’, followed by 12% at ‘School’. Just over half of non-core energy was eaten at home, followed by 13% at ‘School’. Non-core kcal consumed as a percentage of the total kcal consumed in each locations are displayed in Figure 1. The vast majority of food eaten at ‘Eateries’ and ‘On the Go’ was non-core (60% and 72%), which was higher compared with food eaten at ‘Home’ (33%). Having a more detailed look at the top 5 non-core foods from the combined ranking in each location (Table 3), ‘Regular soft drinks’ came first in the ranking of most ‘where’ categories, apart from ‘School’, where it was ranked third. ‘Crisps & savoury snacks’ and ‘Chips & potato products’ were also highly ranked in multiple locations, while some non-core foods were only highly ranked in specific locations, e.g. ‘Burgers & kebabs’ were only among the top 5 food eaten at ‘Eateries’; ‘Alcoholic Beverages’ were only highly consumed at ‘Eateries’; and ‘Savoury sauces & pickles’ were only among the top 5 non-core foods at ‘Work’.

### **Non-core food intake across the ‘with whom’ eating contexts**

In Table 1, the percentages of total and non-core kcal consumed across the ‘with whom’ eating contexts are presented. Most total kcal were consumed with ‘Friends’ followed by being ‘Alone’ and with ‘Parents & siblings’, while similarly most non-core kcal were consumed with ‘Friends’ followed by being ‘Alone’ and with ‘Family & friends’. The percentages of non-core kcal consumed in each ‘with whom’ category out of the total kcal consumed can be seen in Figure 2. Eating with ‘Friends’ was associated with a higher percentage of non-core kcal compared to eating with ‘Parents/Carers’ or ‘Parents & Siblings’ (53% vs. 36% and 33% respectively). Similarly to the non-core foods intake across ‘where’ eating contexts, ‘Regular soft drinks’ were first in the ranking, this time in all the ‘with whom’ categories (Table 4). Other persistent foods reported across most 5 ‘with whom’ categories were ‘Chips & potato products’, ‘Crisps & savoury snacks’ and ‘Chocolate’. There were also non-core foods associated with specific ‘with whom’ categories, for example ‘Savoury sauces & pickles’ were highly ranked when eating with ‘Parents/Carers’, ‘Parents & siblings’ and ‘Family & friends’.

but not when 'Alone' or with 'Friends'; 'Non-core pizza & pasta dishes' were highly ranked when eaten with 'Parents & siblings' and 'Family & friends'.

## Discussion

This is the first study that describes adolescents' non-core food intake in the UK. Adolescents' consumption of non-core foods was 39.5% of their energy intake and the top 5 non-core foods consumed were 'Regular soft drinks', 'Crisps & savoury snacks', 'Chips & potato products', 'Chocolate' and 'Biscuits'. Total non-core food intake was higher at 'Eateries' and 'On the Go' compared to eating at 'Home' and it was also higher when adolescents were eating with 'Friends' compared to eating with 'Parents/carers' or 'Parents & siblings'. Although there were persistent foods across most eating contexts, i.e. 'Regular soft drinks', 'Chips & potato products', 'Crisps & savoury snacks' and 'Chocolate', some non-core foods were uniquely associated with specific eating contexts, i.e. 'Burgers and kebabs' with 'Eateries' or 'Non-core pizza & pasta dishes' associated with 'Parents & siblings' and 'Family & friends'.

The overall proportion of non-core food intake from our findings was similar to non-core food intake in Australia (41.5%-42.7%)<sup>(8,9)</sup>, as well as to energy intake from foods high in solid fats and added sugars (SOFAs) in the US (34%)<sup>(26)</sup>. Total non-core food intake in our study was higher in specific settings, i.e. at 'Eateries', at 'On the Go' and with 'Friends'. A few studies have reported higher energy intake in restaurants and fast food places compared to energy intake at home<sup>(18,27)</sup>, while there is less evidence about energy intake in different social settings. In a sample of Canadian adolescents, the reported energy intake with friends was not statistically different to the energy consumed when being with family members or alone<sup>(18)</sup>, although the study only assessed energy intake during lunchtime. In addition, roughly similar to the top non-core foods in our study, the top 5 non-core foods among Australian children and adolescents (2-16 year olds) were sugar-drinks, sweet biscuits, potato crisps and snacks, cakes and muffins and fried potatoes<sup>(28)</sup>.

Non-core foods in our sample contributed 39.5% to adolescents' diet, which is almost two to 4 times higher to the 5-20% intake specified by the AGHE<sup>(7)</sup> or the 8-19% intake of empty calories specified by the Dietary Guidelines for Americans<sup>(29)</sup>. In the UK, the Eatwell Plate states that foods and drinks high in fat and/or sugar should be consumed in small amounts<sup>(30)</sup>, however it does not provide any advice on what the recommended intake should be. It could therefore be argued that adopting the non-core food model could allow for specific

recommendations to be made about the appropriate limits on intake of these foods as part of a balanced diet.

Having a look at specific non-core foods across eating contexts the amount of non-core food eaten was higher at 'Eateries', 'On the Go' and with 'Friends'. As noted, adolescents' energy intake in restaurants and fast food places has been shown to be higher compared to eating at home <sup>(18, 27)</sup>, however the nutritional quality of this energy intake has not been assessed. Foods consumed in 'away from home' locations are often high in energy density and provide high energy from fat <sup>(31,32)</sup>, and our study strengthens this evidence by showing a higher percentage of food intakes in out of home locations comes from non-core food. In addition, higher intakes of 'unhealthy' foods, i.e. snacks, soft drinks, desserts, have also been reported in relation to peers' consumption <sup>(16)</sup> and peers' support <sup>(33)</sup>, as it is believed that transition to adolescence is characterised by increased peer influences <sup>(34)</sup>.

The most common types of non-core foods seemed to be the same regardless of the physical or social setting. 'Regular soft drinks' were highly ranked in all eating contexts, while 'Chips & potato products', 'Crisps & savoury snacks' and 'Chocolate' were among the top 5 non-core foods in the majority of eating contexts. Similarities of foods contributing to empty calories, across physical eating contexts (defined as the place of purchase), have also been observed among adolescents from NHANES <sup>(17)</sup>, where sandwiches, pizza, grain desserts and sugar sweetened beverages (SSBs) were among the high scorers. Hence, it could be argued that while the physical and social context does not seem to affect the type of non-core food eaten, it does appear to influence the amount of non-core food consumed.

Regular soft drinks was the most highly consumed non-core food in our sample regardless of the eating context. Soft drinks have also been reported to be the most popular snack choice among 13-16 year old British adolescents <sup>(11)</sup>, while sugar drinks including soft drinks, juice drinks, and sweetened tea/coffee have been the number one beverage providing the most daily energy among 13-18 year old adolescents in the UK <sup>(35)</sup>. Therefore, since consumption of soft drinks occurs in every eating context and at the same time it is highly ranked in terms of kcal contribution and popularity, policies aiming to change non-core food consumption in adolescence should target this food group. In addition, soft drinks' importance to health has also been underlined, as findings from a review and meta-analysis suggest a link between children's and adolescents' consumption of sugar sweetened beverages and the promotion of weight gain <sup>(36)</sup>. Hence, from a public health perspective, targeting soft drinks can be an alternative for changing levels of non-core food consumption and subsequently improve diet in adolescence.

Our study is strengthened by the use of data from a representative adolescents sample in the UK and used a simple and explicit classification of non-core foods. In addition, the use of detailed prospective food diaries allowed the collection of ‘real time’ information of food intake in relation to the eating context, rather than assessing frequency of consumption. By recording the foods at the time they are consumed, rather than relying on recalled intakes, food diaries provide more accurate information and a better description of the type and the portion size of the food, compared to other dietary assessment methods, i.e. Food Frequency Questionnaire (FFQ) or a single 24 Hr recall <sup>(37)</sup>.

However, this study has also its limitations. The analysis is only descriptive at population level and does not account for the individual differences or within person variation. Therefore, we cannot be sure that different contexts are causally related to the consumption of non-core food as we have not accounted for the types of people that tend to eat in certain contexts. Confounding by individual characteristics such as age, sex, body size, and social class could be controlled with the use of multilevel models to explore the independent determinants of non-core food intake and should be explored in future studies. Another point to address is the validity of food diaries to capture food intake in specific eating contexts. Adolescents may forget to take the food diary to places out of the home and subsequently there may be omissions of specific foods and drinks <sup>(38)</sup>. Therefore, the amount of food eaten outside of the home may be underestimated.

## **Conclusion**

The present study is the first to describe adolescents’ non-core food intake in the UK in total and across different eating contexts. On the basis of this data, food environments like ‘Eateries’, ‘On the Go’ and eating with ‘Friends’ could be targeted by future interventions and policies in order to reduce non-core food consumption. However, further evidence on the causal nature of this association is required from multi-level, longitudinal or RCT studies to rule out confounding and reverse causality. The eating context did not affect the type of non-core food consumed, and the fact that regular soft drinks were highly consumed regardless of the environment where adolescents ate, reinforces the need for this as a specific target for interventions to reduce the intake of non-core foods among adolescents.

Table 1: Percentages of total and non-core food consumption (% kcal) overall and across ‘where’ and ‘with whom’ eating contexts.

	<b>Total kcal (%)<sup>b</sup></b>	<b>Non-core kcal (%)<sup>c</sup></b>
<b>Overall</b>	100.0	39.5
<b>Where<sup>a</sup></b>		
Home	65.7	55.2
Friend's/Relative's house	4.8	6.2
School	12.1	13.2
Eateries	6.4	9.2
On the go	5.5	9.2
Activity/Other places	3.6	5.0
Work	1.9	2.0
<b>With whom</b>		
Alone	19.1	18.4
Parents/Carers	17.6	14.5
Parents & Siblings	19.0	15.1
Family & Friends	16.4	15.3
Friends	27.9	36.6

<sup>a</sup> ‘Where’ refers only to the place where food was consumed.

<sup>b</sup> Percentages of total kcal across the ‘where’ and ‘with whom’ eating contexts were calculated by dividing the amount of kcal consumed in each of these contexts with the total kcal consumed in the entire survey and then multiplying it by 100.

<sup>c</sup> The percentage of non-core kcal overall was calculated by dividing the amount of non-core kcal across the entire survey with the total amount of kcal in the entire survey and then multiplying by 100. Percentages of non-core kcal across the ‘where’ and ‘with whom’ eating contexts were calculated by dividing the amount of non-core kcal consumed in each of these contexts with the total non-core kcal consumed in the entire survey.

Table 2: Percentage of non-core kcal consumed out of all kcal consumed in the survey, according to age, gender and SES.

<b>Age category (y)</b>	<b>n</b>	<b>Non-core kcal (%)</b>
11-12y	145	37.6
13-15y	258	40.6
16-18y	263	39.5
<b>Gender</b>		
Boys	342	38.7
Girls	324	40.6
<b>SES<sup>a</sup></b>		
High	271	38.4
Intermediate	117	39.0
Low	260	43.4

SES, Socio-economic status

<sup>a</sup> SES was calculated from the National Statistics Socio-economic Class (NS-SEC), which is based on occupation <sup>(25)</sup>

Table 3: Combined ranking of top 5 non-core foods in total and across each 'where' category. The ranking of each food group is a combination of the non-core food's contribution to total non-core food intake and the food's popularity among adolescents.

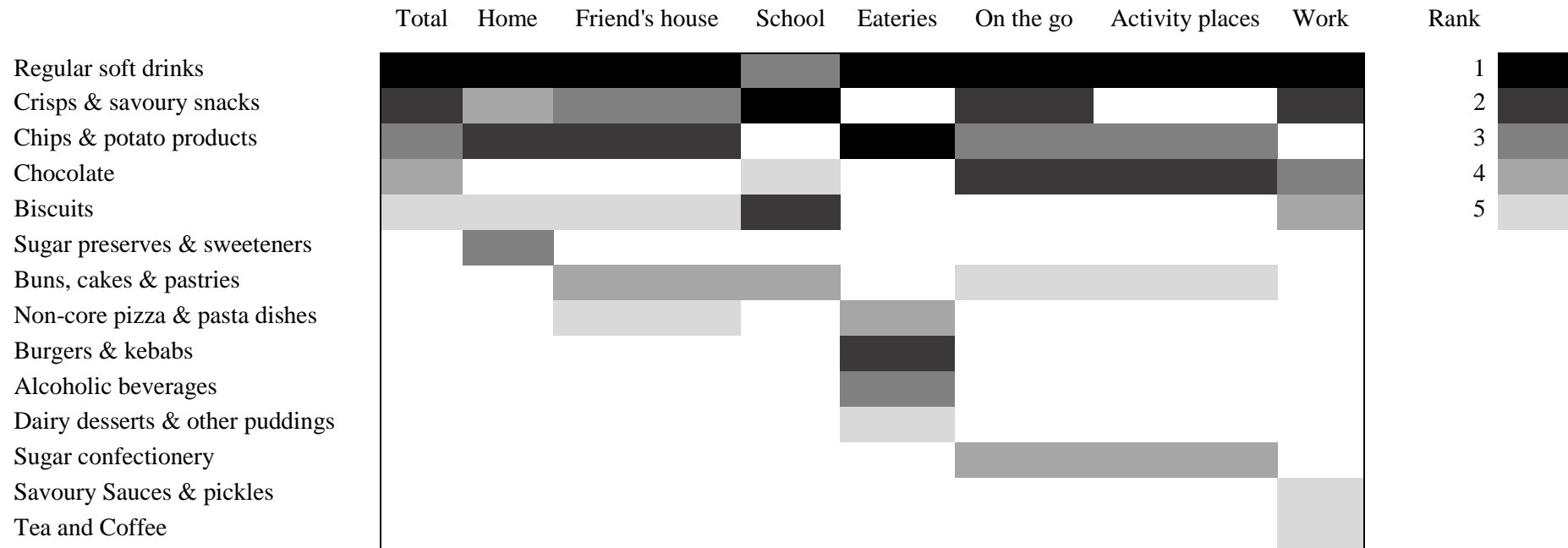




Table 4: Combined ranking of top 5 non-core foods in total and across each 'where' and 'with whom' category. The ranking of each food group is a combination of the non-core food's contribution to total non-core food intake and the food's popularity among adolescents.

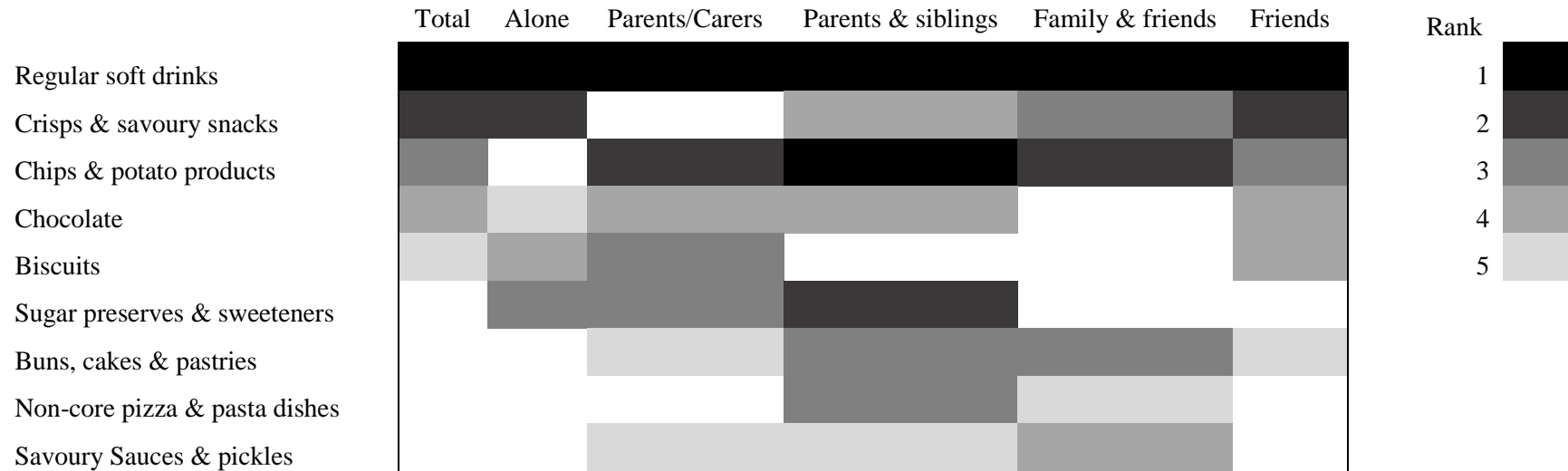
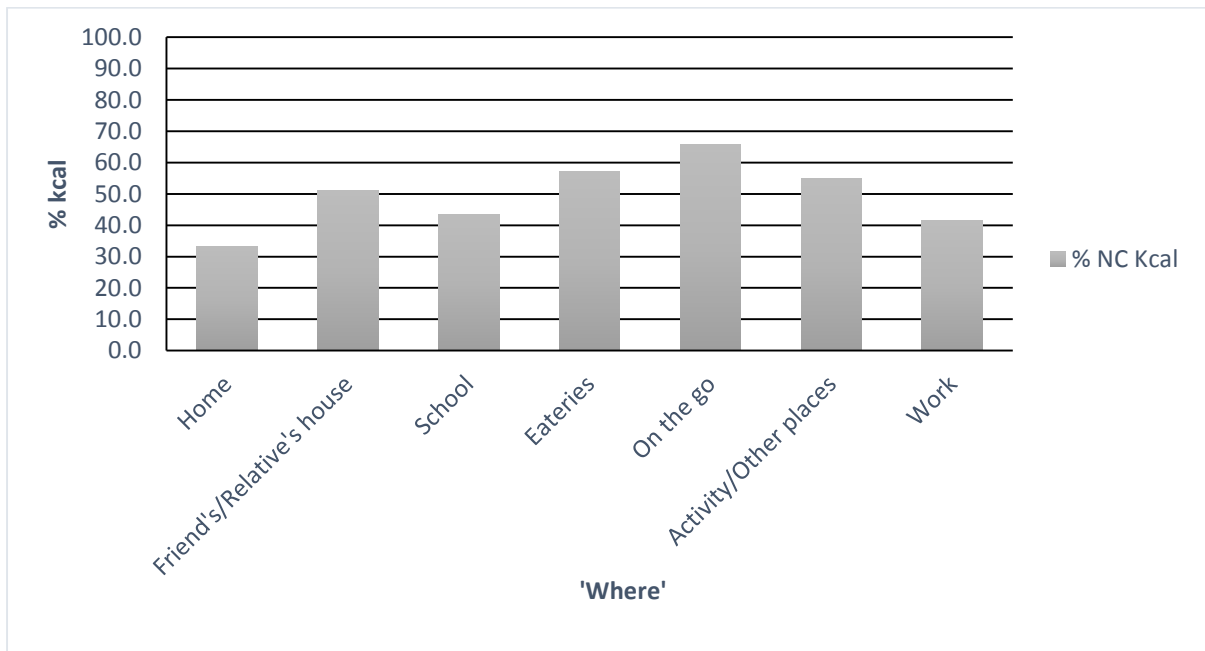
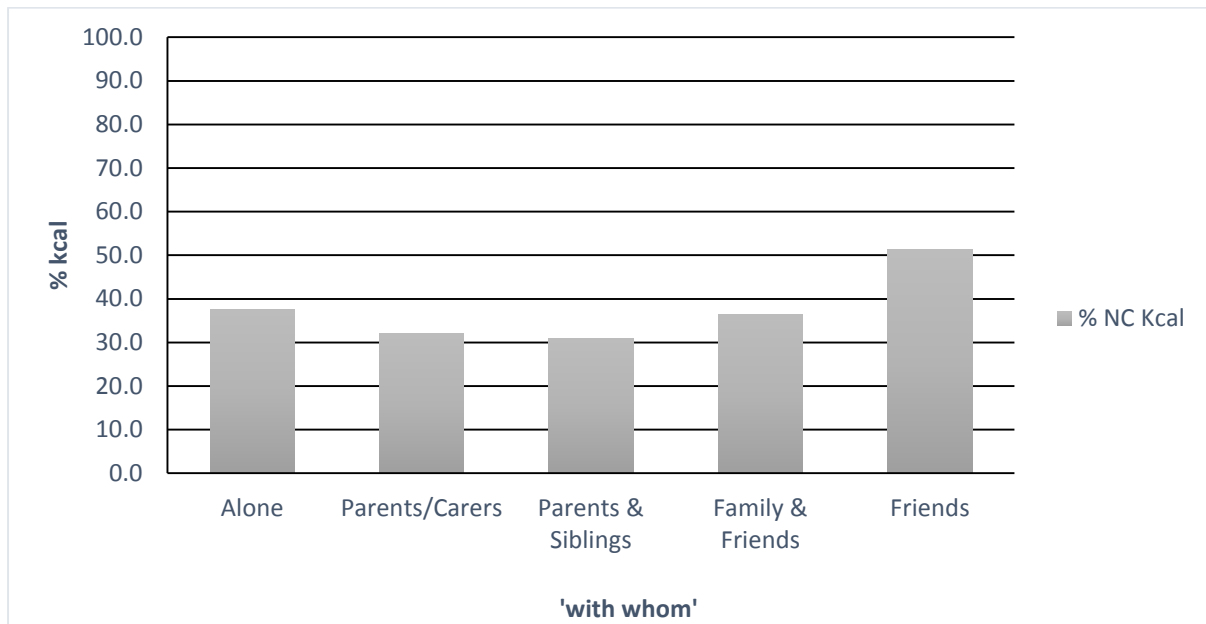


Figure 1: Percentages of non-core kcal consumed in each 'where' category. Percentages are calculated by dividing the amount of non-core kcal consumed in a 'where' eating context with the total kcal consumed in the same eating context.



NC, non-core

Figure 2: Percentages of non-core kcal consumed in each 'with whom' category. Percentages are calculated by dividing the amount of non-core kcal consumed in a 'with whom' eating context with the total kcal consumed in the same eating context.



NC, non-core

Supplementary Table 1: Breakdown of original mixed and non-core food groups to new non-core food groups.

<b>Food group code</b>	<b>New food group name</b>	<b>Original NDNS food groups</b>	<b>Classification</b>
<b>1</b>	Non-core pizza & pasta dishes	Pasta, rice & other cereal	Mixed
<b>2</b>	Non-core bread	White bread	Mixed
		Other bread	Mixed
		Brown granary and wheatgerm bread	Mixed
<b>3</b>	Biscuits	Biscuits	Mixed
<b>4</b>	Dairy desserts & other puddings	Puddings	Mixed
		Other milk and cream	Mixed
		Yogurt, fromage frais and dairy desserts	Mixed
<b>5</b>	Crisps & savoury snacks	High-fat cheese	Mixed
		Crisps and savoury snacks	Mixed
		Nuts and seeds	Mixed
<b>6</b>	Butter, margarine, fats & oils	Butter	Non-core
		Other margarine, fats & oils	Mixed
		Reduced fat spread	Mixed
<b>7</b>	Burgers & kebabs	Burgers and kebabs	Mixed
<b>8</b>	Meat pies & pastries	Meat pies and pastries	Non-core
		Other meat and meat products	Mixed
<b>9</b>	Chips & potato products	Chips fried & roast potatoes and potato products	Mixed
		Other potatoes, potato salads & dishes	Mixed
<b>10</b>	Sugar preserves & sweeteners	Sugar preserves, spreads & sweeteners	Non-core
		Artificial sweeteners	Non-core
<b>11</b>	Sugar confectionery	Sugar confectionery	Non-core
<b>12</b>	Chocolate	Chocolate confectionery	Non-core
<b>13</b>	Ice cream	Ice cream	Non-core
<b>14</b>	Buns, cakes & pastries	Buns, cakes, pastries & fruit pies	Non-core
<b>15</b>	Alcohol	Spirits & liquors	Non-core
		Wine	Non-core
		Beer, lager, cider & perry	Non-core
<b>16</b>	Savoury sauces & pickles	Savoury sauces, pickles, gravies & condiments	Mixed
<b>17</b>	Tea & coffee	Tea, coffee and water	Mixed
<b>18</b>	Regular soft drinks	Soft drinks not low calorie	Non-core
<b>19</b>	Diet soft drinks	Soft drinks low calorie	Non-core
<b>20</b>	Beverages dry weight	Beverages dry weight	Non-core

Mixed food groups included both core and non-core food items.

Supplementary Table 2: Breakdown of original 'where' eating contexts

<b>Home</b>	Home - Bedroom
	Home - Dining Room
	Home - Garden
	Home - Kitchen
	Home - Living Room
	Home - Other
	Home - Unspecified
	Carer's home
<b>Friend's or Relative's house</b>	Holiday Accommodation
	Friend's or Relative's house
<b>School</b>	School - Canteen - Bought food
	School - Canteen - Food from home
	School - Canteen - Other
	School - Classroom
	School - Other
	School - Playground
<b>Eateries</b>	Coffee shop, cafe, shop, deli, sandwich
	Fast food outlet
	Restaurant, pub, night club
<b>On the go</b>	Not At Home - Unspecified
	Outside - Other
	Street
	Bus, car, train
<b>Activity and other places</b>	Leisure Activities, shopping, tourist a
	Sports club, sports leisure venue
	Community Centre/Day Centre/Drop in
	Community centre/day centre/drop-in
	Place of Worship
	Public Hall/Function Room
	Other place
	Unspecified
<b>Work</b>	Work - Canteen - Bought food
	Work - Canteen - Food from home

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Work - Canteen - Other

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Work - Desk

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Work - Other

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Supplementary Table 3: Breakdown of original ‘with whom’ eating contexts

<b>Alone</b>	Alone
<b>Parents/carers</b>	Parent(s)/Carer
<b>Parents &amp; siblings</b>	Parent(s)/Carer & Siblings
	Siblings
<b>Family &amp; friends</b>	Family (incl. Relatives)
	Family & Friends
	Carer & Other Children
	Child/Children
<b>Friends</b>	Friends
	Others - General Public
	Others General public
	Others - Known to Respondent
	Others known to Respondent
	Partner
	Partner & Children
	Work colleagues
Flatmate	
<b>Not specified</b>	Not specified

Supplementary Table 4: Percentages of the top 5 non-core foods' contribution to total non-core calorie intake and of non-core foods' popularity among adolescents (in total and across each 'where' eating context).

	Total		Home		Friend's house		School		Eateries		On the go		Activity places		Work	
	%ncEI	%N	%ncEI	%N	%ncEI	%N	%ncEI	%N	%ncEI	%N	%ncEI	%N	%ncEI	%N	%ncEI	%N
Regular soft drinks	13.2	79.4	10.8	57.9	11.9	45.2	12.1	38.8	18.7	63.5	17.3	48.5	22.8	47.4	23.1	42.7
Crisps & savoury snacks	9.6	71.0	8.8	50.2	6.6	19.6	16.7	43.5	2.9	10.8	11.9	29.3	8.8	21.3	14.7	34.7
Chips & potato products	11.5	63.1	11.3	45.9	10.8	19.2	6.6	11.6	19.5	36.1	15.7	21.0	7.3	9.0	6.3	9.3
Chocolate	9.1	59.6	9.0	38.5	7.5	16.4	10.1	25.1	3.2	7.9	12.9	25.6	12.4	19.9	12.0	21.3
Biscuits	8.7	56.9	9.8	42.9	6.7	17.4	14.6	35.4	1.2	2.5	4.4	12.7	5.4	11.8	7.2	20.0
Sugar preserves & sweeteners	3.6	64.7	5.4	60.3	2.0	18.3	2.2	10.0	0.4	4.6	0.6	4.6	1.8	8.5	4.3	18.7
Buns, cakes & pastries	8.6	50.3	9.2	33.7	8.0	16.9	12.9	25.9	3.4	9.5	6.2	9.0	7.5	12.3	5.2	8.0
Non-core pizza & pasta dishes	7.2	42.6	8.7	31.4	11.1	12.8	6.6	12.9	5.7	10.4	2.1	2.5	3.3	4.3	0.0	0.0
Burgers & kebabs	3.9	24.0	2.7	12.0	3.7	4.6	0.6	1.8	14.0	22.8	4.8	6.5	4.3	3.3	6.1	5.3
Alcoholic beverages	3.9	17.6	1.5	10.4	16.9	11.9	0.0	0.3	16.9	15.4	3.3	2.5	2.5	3.3	0.7	1.3
Dairy desserts & other puddings	2.9	28.8	3.2	20.2	2.6	6.4	3.3	10.8	4.1	10.0	1.2	3.1	1.1	1.4	0.9	5.3
Sugar confectionery	2.8	35.3	2.0	19.4	1.6	8.2	2.0	12.9	1.7	7.1	7.7	25.3	9.6	19.0	0.6	10.7
Savoury Sauces and Pickles	3.2	68.2	3.5	54.3	1.5	14.2	4.8	28.2	1.8	14.5	2.4	10.2	1.9	10.4	3.5	21.3
Tea and Coffee	0.2	49.2	0.0	44.7	0.0	18.3	0.1	3.2	0.4	5.0	0.2	3.4	0.6	10.4	3.5	30.7

% ncEI = percentage of total non-core calorie intake in that specific context; % N = percentage of people eating that food in that specific context



Supplementary Table 5: Percentages of the top 5 non-core foods' contribution to total non-core calorie intake and of non-core foods' popularity among adolescents (in total and across each 'with whom' eating context).

	Total		Alone		Parents/Carers		Parents & siblings		Family & Friends		Friends	
	%ncEI	% N	% ncEI	% N	% ncEI	% N	% ncEI	% N	% ncEI	% N	% ncEI	% N
Regular soft drinks	13.2	79.4	13.2	42.0	11.7	35.5	9.6	35.7	11.2	47.6	14.9	56.3
Crisps & savoury snacks	9.6	71.0	13.2	35.6	5.7	17.5	6.0	22.9	6.5	23.1	11.3	45.5
Chips & potato products	11.5	63.1	4.4	7.9	11.8	20.9	16.7	32.9	17.9	36.0	11.0	27.2
Chocolate	9.1	59.6	12.0	23.9	7.5	18.5	6.8	21.5	5.9	20.2	9.3	33.6
Biscuits	8.7	56.9	13.1	28.9	11.3	20.4	6.9	19.3	5.9	18.7	7.4	30.4
Sugar preserves & sweeteners	3.6	64.7	6.6	38.2	5.2	37.2	4.2	37.7	3.2	29.1	1.8	18.3
Buns, cakes & pastries	8.6	50.3	9.0	15.0	9.4	16.8	9.9	21.2	10.6	22.2	7.8	24.0
Non-core pizza & pasta dishes	7.2	42.6	5.9	8.3	7.2	10.9	10.1	19.5	8.5	18.4	6.4	16.9
Savoury Sauces and Pickles	3.2	68.2	2.0	13.1	4.9	28.2	3.9	35.7	3.5	36.0	3.2	30.2

% ncEI = percentage of total non-core calorie intake in that specific context; % N = percentage of people eating that food in that specific context

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