# Socio-economic patterning of expenditures on 'out-of-home' food and non-alcoholic beverages by product and place of purchase in Britain

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## Background

Diets with high intake of added sugars, salt and saturated fats, as well as low intake of fruit, vegetables and fibre are key risk-factors for obesity, diabetes and associated non-communicable disease globally (1). In the UK, more than 27% of the adult population and 17% of 2 to 15 year old children are obese (2) with diet-related ill-health overall thought to account for 12% of total mortality (3). While most food is consumed at home, food eaten out-of-home (e.g. in restaurants, fast-food outlets, cafes, workplaces, during travel) plays an important role, with food and beverages purchased for out-of-home consumption accounting for more than quarter of total food expenditures in the UK. (4, 5).

A growing literature focuses on the contribution of out-of-home food consumption to total diet, in particular fast food and takeaway meals (6). Four recent systematic reviews have identified positive associations between eating out-of-home and higher energy intake or higher body weight (7-10). This association is mostly explained by consumption of fast food, which contains high levels of fat, including saturated fats, and energy (11-16). Recent evidence shows that restaurant meals may also have excessive energy content and rarely meet dietary recommendations (17). Frequent consumption of out-of-home meals increases the risk of exceeding the energy and nutrient requirements and is thus thought to lead to greater risk of developing disease (18-20).

Studies exploring socio-economic differences in out-of-home food consumption are rare. These few studies report that more affluent households tend to eat meals out-of-home more often (11, 16, 21) while those on lower incomes, particularly children from low-income households, eat lower nutritional-quality takeaway meals more frequently (6, 11).

While full meals are likely to be the predominant type of foods consumed out-of-home (e.g. at a restaurant or takeaway meals) (22), snacks and beverages consumed on-the-go may also significantly contribute to discretionary energy intake (6). Research has tended to focus on patterns of fast food and takeaway food consumption, with relatively little known about consumption patterns for a broader range of out-of-home foods (such as sweet snacks) as well as from where these products are purchased.

Understanding these broader patterns is important in order to better design and target interventions and policies aimed at reducing consumption of less healthy foods and beverages. As point-of-purchase (or point-of-sale) is possibly an effective point at which intervention might occur (e.g. pricing, placement, labelling) (23-25), it is crucial to know which types of foods and beverages are bought in the full range of out-of-home settings in order to establish where policies should be targeted.

In this paper, we use a large, novel, nationally representative dataset recording product-level purchases in Britain, to investigate recent patterns of out-of-home purchases as well as analyse socio-economic differences in these patterns. This work contributes to the existing literature by looking at a comprehensive range of foods and beverages as well as different outlet types from where the products are purchased.

## Methods

### *Panel*

The data are from Kantar Worldpanel, a nationally representative panel of approximately 30,000 British households that records household expenditures at the product-level, including on foods and beverages purchased and taken home (the take-home panel). A subsample of this panel (approximately 6,000 households annually) also records food purchase data for out-of-home consumption since mid-2015 (26) which is the primary subject of this study (take-home purchase data was used only to estimate total take-home food expenditure for a comparison).

The out-of-home purchase dataset covers food and non-alcoholic beverage purchases for consumption outside of homes for the period between June 2015 and December 2017. Purchases, recorded with a mobile application, were made by 9,703 respondents nested in 8,326 households across the two and half year period. This means that for a small number of households (8% in 2015 and 12% in 2016 and 2017), more than one person recorded data on purchases. These could be other adults in the household or children aged over 12 (those aged 12-16 record purchases with parental supervision).

The out-of-home sample is nationally representative with respect to age and sex of the individual and occupational social grade and geographical region (10 regions in Britain) of the respondent. Sample representativeness by demographic characteristics is assessed by Kantar Worldpanel every 4 weeks. Data include observation-specific gross-up weights to provide a representative picture of total out-of-home food and beverage purchases accounting for both demographic characteristics of the sample and under-reporting. Socio-demographic data are provided for each panel year.

***Expenditure data***

The out-of-home purchase dataset includes product-level records on expenditure, outlet type of the purchase (recorded through a mobile phone application by the panellist) and for whom the product was purchased (either self, a child or another adult). Observations can therefore include foods or beverages bought for other people (adults or children), including non-family members. At product level, purchases for others account for 31% of observations.

The mobile application allows barcode scanning and manual entry of information regarding the purchase (outlet, product type if no barcode available, volume/quantity, amount spent). To enter names of outlets or products, respondents can have a pre-defined menu (e.g. for well-known fast-food chains) or broad meal choices (e.g. for an independent restaurant) with opportunity to provide more details in an open dialog box. Entries are cross-checked against receipts if these are uploaded by the panellist.

***Outlet classification***

We combined food outlets into four distinct categories - cafes and restaurants (32.7% observations), takeaway and fast-food outlets (19.0%), supermarket and convenience stores (19.7%), and 'other' outlets (28.6%). Table S1 in supplemental file describes these categories in more detail. Given the varying level of information available on the purchase outlet (296 distinct descriptions ranging from specific brands to generic 'cafe' or 'restaurant'), our main consideration in creating the aggregate categories was whether the outlet was part of food service (either sit-down service cafes and restaurants or quicker service fast-food and takeaway) or food retail (supermarket, convenience store, newsagent etc.). Where this was not clearly distinguishable, the outlets were grouped into 'other' outlets (e.g. tourist attraction, leisure centre,

pharmacy). We also had to consider the size of disaggregate groups (see Table S1) to have enough observations for meaningful interpretation.

### *Food group classification*

Given the heterogeneity in the level of detail available across individual food and beverage product descriptions, we created eight distinct food or beverage groups (see Table S2 in supplemental file for classification). These were main meals (23% of observations, including for example meals based on different meats, fish, vegetarian dishes, breakfast meals, pizza); quick meals (16%, including sandwiches, salads, soup, savoury pastry); cold non-alcoholic beverages (16% including soft-drinks, water, juice); hot beverages (26%, including coffee, tea and hot chocolate); sweet snacks (13%, including desserts, pastries, confectionary, chocolates, etc.); savoury snacks (3%); fruits and vegetables (3%) and other (1%). The data excludes purchase information on alcoholic beverages. Expenditure data were inflation-adjusted using the Office for National Statistics Consumer Price Index for food and non-alcoholic beverages (27).

### *Socio-economic status indicators*

SES is a multi-dimensional measure that is often characterised through a combination of separate measures of occupation, education and income, which all influence food choices and diet quality and serve as approximation for further determinants such as culture, knowledge and skills, or external environments including neighbourhood characteristics (28, 29). We used occupational social grade of the respondent as the main marker of SES as the only individual-level indicator available. This was provided in five categories: higher and intermediate (A&B) managerial, administrative or professional occupations; supervisory, clerical and junior managerial administrative or professional occupations (C1); skilled manual workers (C2); semi- or unskilled manual

workers (D); and finally state pensioners, casual or lowest grade workers, and those unemployed with state benefits (E) (30). For the analysis we further recoded the variables into three categories: high (A&B), mid (C1&C2) and low (D&E) (30). For those 18 and under, the occupational social grade was applied as that of the main adult respondent of the household.

Education of the main household shopper (i.e. household level information rather than individual level) was included as a covariate in the models. We did not interpret education as an explicit marker of SES because it was only available for the main shopper, and because of the evident secular trends and changes over time in the education system in Britain, which means that education differences have slightly different meanings for different age groups (31). Although information on household income was available, we did not use it as an alternate SES marker (31), as there were around 10% of households who had refused to answer the question. Missing data analyses revealed that income 'missingness' depended on expenditure share (i.e. outcomes) in half of the outlets as well as 5 out of 8 food groups, which implies that an analysis of the complete cases would be biased for the majority of the models.

***Statistical analyses***

We first estimated population-level *per capita* expenditure and expenditure share for take-home food and out-of-home food, followed by expenditure (share) on type of out-of-home outlet and food group. These estimates were derived in two steps. First, we calculated total weighted market-level expenditure (by outlet type and by food group) for each year and for all years combined. Second, we divided these into weekly per capita expenditures using population size estimates for Britain (see Table S3 in supplemental file). Expenditure shares by outlet type or food group (for each year and

all years combined) were calculated as a ratio of expenditure in outlet or food group to total expenditure in that year (and all years combined). Results were stratified by the three (high, mid, low) occupational social grades.

We then applied adjusted linear multi-level models to test for differences in expenditure share of out-of-home outlets and food types by occupational social grade, measured via expenditure shares for each outlet and food group. For this purpose, we used unweighted individual-level data, accounting for clustering at individual level with random intercepts. As the sample was an unbalanced panel, we used restricted maximum likelihood estimation and used bootstrapped standard errors (1,000 replications).

In addition to occupational social grade of the respondent (high, mid, low) (which we refer to as SES hereafter, for brevity), the models were further adjusted for three individual-level (age, sex, region) and three household-level socio-demographic characteristics (highest education of the main household respondent, household size, and presence of children (yes/no). Respondent age was grouped into seven age categories – 12-18, 19-29, 30-39, 40-49, 50-59, 60-69 and 70 and over. Region of residence was coded in 10 categories - London, Midlands, North East, Yorkshire, Lancashire, South England, Scotland, East England, Wales and West of England, and South West.

Education included the following categories ‘degree or higher’, ‘further or higher education (below degree)’, ‘A level’, ‘GCSE’, ‘other/unknown’ or ‘none’. As the variable was retrieved from the take-home panel information, we assigned education level of the main respondent of the take-home panel to all individuals from that household. We also included annual dummy variables to account for time effects. To allow interpretation of

estimated coefficients as percent point (pp) differences in expenditure shares in the text, the estimated coefficients were multiplied by 100.

Finally, we conducted a descriptive analysis on the frequency of the purchasing to be able to compare results to prior research based on the National Diet and Nutrition Survey (NDNS) data (e.g. (12, 22)). Similar to these papers we use two categories for frequency of purchases – those purchasing once a week or more often and those purchasing less frequently. We calculated the proportion of individuals in these groups by SES over outlet type and food group, applying clustered standard errors by individual. All data analyses were performed using Stata MP version 15.1 (32).

## Results

Throughout the 2.5 year period we observed n=2,734,987 purchases. On average, 34% of the 8,326 households reported purchases in at least 24 months, 58% at least for 12 months and 71% for six months. Table 1 shows the descriptive statistics of the full sample either at individual or household level, depending on its measurement.

*[Table 1 here]*

Table 2 shows population-level per capita estimates for weekly out-of-home expenditures and a comparison to take-home food expenditures. During the study period, out-of-home purchases ranged from 34-39% of total food expenditure among high- and mid-SES groups to 25-28% among those in low-SES group. In absolute terms the high- and mid-SES groups spent more on out-of-home purchases in 2017 (£15.11 and £17.76 vs £9.69). Expenditures out-of-home changed only marginally in all three

SES groups between 2015 and 2017. Therefore, we report the per capita expenditure and expenditure share in different outlets and on different foods as 2.5 year averages.

*[Table 2 here]*

## Population-level *per-capita* estimates of out-of-home purchases

### *By food outlet*

All SES groups spent the greatest share of their out-of-home expenditure in restaurants and cafes, ranging between 40% for low-SES and 47% in high-SES respondents (Figure 1A). Expenditure share in fast-food and takeaway outlets showed a reverse pattern with the lowest share of 17% in high-SES respondents in comparison to 27% in low-SES respondents. Expenditure share in supermarkets and convenience stores appeared marginally greater for low-SES respondents but did not vary for 'other' outlets.

For absolute expenditure, greater differences emerge (Figure 1B). High- and mid-SES groups spent nearly twice as much in cafes and restaurants (£7.02-7.18) and in 'other' outlets (£3.79-£3.81) in comparison to the low-SES (£3.61 and £1.92, respectively). Highest expenditure in fast-food and takeaway outlets was observed among the mid-SES group (£3.65) in comparison to high- (£2.66) and low-SES (£2.41) group, respectively.

*[Figure 1 here]*

### *By food group*

Expenditure on meals eaten out-of-home accounted for the largest share of expenditures across SES with 42-43% of expenditures on main meals and a further 17-18% on quick meals (Figure 2A). However, absolute expenditure on meals for low-SES respondents was only half that of mid- and high-SES respondents (£5.43 combining

main and quick meals vs £9.96 and £9.37) (Figure 2B). This pattern, of similar expenditure shares across SES groups but overall lower spending in the low-SES group, was also repeated for other food groups. Quick meals and hot beverages had the next largest expenditure share, accounting each for 17-18% of out-of-home expenditure across all SES groups. This was followed by non-alcoholic beverages (10-12%) and sweet snacks (8-9%). Savoury snacks, fruit and vegetables and the remaining "other" group accounted for very small overall expenditures as well as expenditure shares (<1% each).

*[Figure 2 here]*

**Individual-level estimates of socio-economic differences**

***By food outlet***

Differences in preferences by SES were clear for purchases from cafes and restaurants as well as fast-food and takeaway outlets (Table 3), showing only a small attenuation when compared to the population-level estimates (Figures 1 and 2). Mid- and low-SES respondents spent a lower share of their expenditure in cafes and restaurants (-3.5 percent points (pp); (95%CI -4.9;-1.9); and -7.1pp: (95%CI -9.0;-5.1)), but a higher share in fast-food and takeaway outlets (2.4pp; 95%CI 1.4;3.5 and 7.3pp; 95%CI 5.7;8.9), respectively. Expenditure share in supermarket and convenience stores was marginally higher for mid-SES respondents at 1.6pp (95%CI 0.1;3.0). Low-SES respondents also spent a lower share of expenditures in 'other' outlets (-1.8pp; 95%CI -3.5;-0.4).

Across different levels of education the pattern observed for food service outlets repeated; those with lower education than the highest category ('degree or higher')

spent a lower share of their expenditures on cafes and restaurants (ranging from -2.7pp to -5.0pp) but a greater share on takeaway and fast-food outlets (0.7pp to 3.1pp).

*[Table 3 here]*

Further significant differences were observed for the remaining demographic variables. For example, compared to 19-29 year olds, respondents in all older age groups had a higher share of expenditure in cafes and restaurants (2.5pp to 21.1pp), and a lower share in fast-food and takeaway outlets (-3.4pp to -10.4pp). Adolescents (12-18 year olds), compared to 19-29 year olds, had a lower share of expenditure in cafes and restaurants (-8.5pp; 95%CI -11.2;-6.0) and in fast-food and takeaway outlets (-5.9pp; 95%CI -8.2;-3.2) but a higher share in supermarkets and convenience stores (9.1pp; 95%CI 6.2; 11.9) and 'other' outlets (4.7pp; 95%CI 2.4;7.2).

Respondents from households with children had a greater share of expenditure in fast-food and takeaway outlets (5.2pp; 95%CI 3.9;6.5) but a lower share in supermarkets and convenience stores (-1.9pp; 95%CI -3.5;-0.6) and 'other' outlets (-3.0pp; 95%CI -4.1;-1.7). Respondents from outside London (with the exception of South of England and South West) had a smaller share of expenditures in supermarkets and convenience stores (-2.9pp to -6.0pp), but a larger share in 'other' outlets (3.3pp to 6.5pp).

***By food group***

The strongest associations between preferences and SES were observed for beverages (Table 3). In comparison to high-SES respondents, mid- and low-SES respondents spent a lower share of their out-of-home expenditure on hot beverages (-1.4pp (95% CI -2.4;-0.3) and -3.1pp (95%CI -4.6;1.7), respectively) but a higher share on cold non-alcoholic beverages (0.9pp (95%CI 0.3;1.6) and 1.5pp (95%CI 0.6;2.5), respectively).

Furthermore, in comparison to the high-SES group, the low-SES group also spent a relatively greater share on main meals (2.5pp; 95%CI 0.8;4.2). The pattern across different levels of education is less clear. In comparison to those with highest education level ('degree or higher'), expenditure share on cold non-alcoholic beverages was marginally larger, but the associations were significant only for those with 'further or higher education (below degree)' or 'GCSE' level. Conversely, those with GCSE level spent less on hot beverages (-1.7pp (95% CI -2.8;-0.7) and more on savoury snacks (0.5pp (95%CI 0.1;1.0).

*[Table 4 here]*

In comparison to 19-29 year olds, 12-18 year olds had a lower expenditure share on meals and hot beverages, but a higher share on non-alcoholic beverages, and sweet and savoury snacks. The higher share of spend on cold non-alcoholic beverages (3.0pp; 95%CI 0.1;5.2) or sweet snacks (7.4pp; 95%CI 5.4;9.7) was greater than the differences observed across SES. Furthermore, non-alcoholic beverage expenditure decreased almost linearly with age – with around 2pp drop in expenditure share for every decade increase in age. For hot beverages, the pattern reversed with expenditure share increasing as the age group increases.

Household size was negatively associated with expenditure share on main meals (-1.9pp; 95%CI-2.4;-1.4), and positively associated with expenditure on non-alcoholic beverages (0.4pp; 95%CI 0.1;0.7) and sweet snacks (1.0pp; 95%CI 0.7;1.3). Households with children, had a greater expenditure share on main meals (3.3pp; 95%CI 1.8;4.9) and cold non-alcoholic beverages (0.4pp; 95%CI 0.1;0.7) but lower on quick meals (-1.3pp; 95%CI -2.4;-0.3) and hot beverages (-1.8pp; 95%CI -2.8;-0.6). There was some regional variation – a joint test of significance indicated that expenditure share differed

by region for four of the food groups (main meals (p<0.001), savoury snacks (p=0.010), hot beverages (p=0.002) and fruit and vegetables (p=0.019)).

### Frequency of out-of-home purchases and socio-economic differences

The patterns in frequency of purchases across food outlets broadly repeats those observed in expenditure share (Figure 3). A third of high-SES respondents (31%, 95%CI 29;33) purchased from cafes and restaurants more than once a week, dropping to a quarter (24%, 95%CI 22;27) for low-SES respondents. For fast-food and takeaway outlets this reverses with 14% (95%CI 13;16) of high-SES respondents purchasing from these outlets more than once a week in comparison to 21% (95%CI 19;23) of low-SES respondents. Purchases in supermarkets and convenience stores are also more frequent among low-SES respondents with 33% (95%CI 31;36) purchasing once a week or more in comparison to 28% (95%CI 27;30) of high-SES respondents. Differences across frequency of food group purchase did not vary significantly by SES with the exception of hot beverages. Forty two percent (95%CI 40;44) of high-SES respondents purchased a hot beverage once a week or more compared to 35% (95%CI 33;38) of low-SES respondents.

## Discussion

To our knowledge, this is the first paper to comprehensively detail socio-economic differences in out-of-home expenditure in Britain by food outlet and food and beverage category. We found that across all SES groups, measured through occupational social grade, out-of-home expenditure ranged from 25-39% of total food and non-alcoholic beverage expenditures. Across outlet type or food group, level of expenditure varied

substantially by SES, with low-SES respondents spending much less (£9.69 in 2017) in comparison to what higher-SES (£15.11) respondents spend, while mid-SES had the greatest overall expenditure (£17.76). While variation in expenditure shares (i.e. how the budget was spent between outlets and food groups) was smaller, we did observe some by SES.

For example, both low- and mid-SES respondents purchased more frequently and spent a greater share of their expenditure in fast-food and takeaways, supermarkets and convenience stores, as well as spent relatively more on cold non-alcoholic beverages. High-SES respondents on the other hand, had more frequent purchasing and greater share of expenditure spent in cafes and restaurants and on hot beverages. This is consistent with existing evidence that lower-SES households tend to rely more on (cheaper) fast-food and takeaway meals (22), which are often associated with excess energy intake and higher bodyweight (7-9). While research associating excessive energy consumption or health outcomes with restaurant meals is missing, there is some evidence to suggest that a large proportion of meals served in restaurant chains in the UK do not meet public health recommendations for energy content (≤600 kcal/meal) (17). Nonetheless, a substantial proportion (more than a third) of out-of-home expenditures by SES were spent outside food service outlets and on non-meal foods or drinks (e.g. snacks and coffee), emphasising the need to take a broader look at what people consume out of homes and how this could affect overall energy and nutrient intake. These patterns were similar across levels of education (as a marker of socio-economic difference rather than occupational grade).

A striking difference emerged between the expenditure spent on sweet or savoury snacks in comparison to fruit and vegetable produce, the latter accounting for only

about 1% of out-of-home purchases. At the same time, hot beverages (coffee, tea, hot chocolate) accounted for 17-18% which, depending on how served, can also be high in sugar and energy-dense (33).

Beyond SES, our findings revealed further relevant socio-demographic patterns. We found that adolescents spent a greater proportion of their out-of-home expenditure on non-alcoholic beverages, and sweet and savoury snacks. According to the NDNS data, non-alcoholic beverages are the main source of sugar in the diet of 11-18 year olds, followed by cereal products (including biscuits and cakes), and confectionery (34). Recent studies have found a negative impact from eating frequent takeaway meals (35) as well as eating more out-of-home in general (16) on the diet quality of adolescents in Britain. Our findings suggest that purchases of snacks and non-alcoholic beverages for consumption outside home need to be also considered in this context. It is particularly notable that the magnitude of the difference between adolescent and adult expenditure was greater than the differences across the SES gradient.

Regional differences in expenditure shares by food outlet type were observed, with respondents from London spending greater share in cafes and restaurants as well as supermarkets and convenience stores. Fast-food, takeaway and other outlet expenditure took up a greater share of expenditure outside London, which may reflect - in addition to preferences - regional variation in the availability of different types of food outlets. However, regional differences in out-of-home budget allocation between different food groups were relatively small.

The findings reported here suggest the importance of population-based policies to cover out-of-home food consumption. The UK government has already recently proposed mandatory energy labelling (36) for out-of-home meals and suggested

potential calorie caps for food served in restaurants or sold in supermarkets (37) as well as restricting price and placement based promotions on foods high in sugar, fat and salt content (38). Considering our findings, these policies are potentially well targeted. Urban planning policies that change and improve the food retail environment may also have potential to decrease excess energy intake and improve diet. Regulation may be able to play a role in promoting healthier food retail alternatives and curbing less healthy outlets or food provision through various measures, including business rates, other type of subsidies for healthier retail outlets or levies on less healthy food.

Our study has a number of strengths. We were able to use a novel, nationally representative dataset providing highly disaggregated longitudinal data. The data compares relatively well with the estimates of the Family Food Survey, the official food expenditure survey in the UK, which finds out-of-home food and beverage share to be around 26-28% of total food and beverage expenditure since 2001 (5). While our estimates of the value of weekly out-of-home expenditure were slightly higher in comparison to the Family Food Survey (~£14 weekly in comparison to £10), it is likely that the Family Food Survey under-reports less frequent food expenditures as it records household food purchases for a 2-week period only at a time in comparison to continuous reporting in Kantar Worldpanel data. For example, the Family Food Survey reported coffee and tea expenditure <£0.01 per week per capita (5) in comparison to £1.54-2.84 spent on hot beverages in Kantar Worldpanel, which on its own is near sufficient to explain the difference in weekly out-of-home expenditures between the two datasets. Kantar Worldpanel weighting also corrects for under-reporting and our per capita estimates were weighted for this, whereas the Family Food Survey estimates are not corrected for under-reporting and this may particularly affect out-of-home expenditures (5).

A further direct comparison with the NDNS would be less straightforward as the latter measures intake rather than purchases and records the locations where foods are consumed rather than bought (34). Nonetheless, our estimates of the frequency of purchases food service outlets (24-31% purchased once a week or more often from cafes and restaurants and 14-21% from takeaway and fast-food outlets) or main meals (34-37% purchased once a week or more often), compares relatively well with recent findings in England. For example, Adams et al. reported 27.1% of adults eating meals out once per week or more, based on NDNS data from 2012-15 (22). Mills et al (2018) analysed data from the Fenland study of adults living in Cambridgeshire (2005-2015) and found that 32.1% of participants ate out at least once per week. While the figures we report are slightly higher, the similarity is reasonable considering different years under study as well as different data collection methods.

There are also some limitations. Most importantly, we did not have product nutrient content information available and therefore we cannot draw conclusions on whether the diet quality varies by SES or other determinants. For example, the quantity bought may vary less than expenditure because prices, particularly when comparing restaurants and fast-food or takeaway outlets, may vary significantly. Thus, more research is needed to understand whether the nutritional quality and quantity of food purchased for consumption out-of-home differs across SES. This is not a trivial task, considering the vast range of types of foods on offer and no mandatory labelling required at the moment. The data may also over-estimate actual intake because of sharing food with others, purchasing for others and possible wastage. However, purchase data are a good indicator of what is bought and from where which is important for intervention design.

We were also not able to estimate out-of-home purchases at household level as we did not observe purchases from all household members, though for one eighth of the households we did see purchases from more than one respondent. This makes it difficult to merge individual-level out-of-home data with household-level take-home food data from the same panel in order to estimate total household purchases.

We also did not have information on purchases of alcoholic beverages. Family Food Survey estimates show that expenditure on alcohol for consumption outside homes accounted for 23% of total out-of-home expenditures in 2016/17 (£3.07 per person week) (5). Finally, given that many food outlets and food groups were only generically described (e.g. cafe/restaurant or bread) or had relatively small number of observations we opted for broader, rather than more specific groupings. This may have masked more intricate socio-economic patterning across food outlets and food groups and certainly warrants further research. Finally, the data included only one individual-level marker of SES, which is a limitation in understanding the full role of the combination of markers that are each understood to have a role in determining food choice and diet quality (28).

## Conclusion

Out-of-home food consumption accounts for up to 39% of food expenditures with the majority spent in cafes, restaurants and fast-food takeaways. However, over a third of out-of-home expenditure was spent in a diverse range of food retail outlets, including supermarkets and convenience stores that are not a current major policy target. Beyond meals, which make up more than half of out-of-home expenditure, a further 38-39% was spent on beverages and snacks. While low-SES households spent less on out-of-home foods, their preferences across outlets or foods differed less in comparison to

mid- and high-SES groups. Consideration and inclusion of foods consumed outside homes is crucial in designing policies and interventions that aim to improve population diet.

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Tables

Table 1. Sample descriptive statistics (n=9,703 individuals from N=8,326 households)

| | **High SES** | **Mid SES** | **Low SES** |
|---|---|---|---|
| Population | 25% | 48% | 28% |
| Number of individuals | 2,350 (24%) | 5,686 (58%) | 1,667 (17%) |
| Number of households | 1,996 (24%) | 4,895 (58%) | 1,435 (17%) |
| Households where main shopper is male* (%) | 44.6 | 39.7 | 40.2 |
| Mean age of main shopper* | 42.9 (13.4) | 43.2 (14.4) | 43.9 (15.6) |
| 12-18 year old (%) | 4.4 | 5.6 | 5.1 |
| 19-29 year old (%) | 10.9 | 13.8 | 18.3 |
| 30-39 year old (%) | 32.2 | 28.4 | 22.7 |
| 40-49 year old (%) | 25.2 | 22.0 | 18.3 |
| 50-59 year old (%) | 14.0 | 15.8 | 17.5 |
| 60-69 year old (%) | 9.3 | 10.3 | 13.6 |
| 70+ year old (%) | 4.0 | 4.2 | 4.5 |
| Mean size of household** | 3.0 (1.3) | 2.9 (1.3) | 2.9 (1.5) |
| % of households that have children** | 47.9 | 46.11 | 43.3 |
| Mean number of children (if have)** | 1.7 (0.7) | 1.7 (0.8) | 1.9 (0.9) |
| Highest education - 'degree or higher' | 66.8 | 32.7 | 12.5 |
| Further or higher education (below degree) | 12.0 | 17.7 | 16.7 |
| A Level | 9.9 | 18.8 | 17.5 |
| GCSE | 7.1 | 21.3 | 33.8 |
| Other/unknown | 3.3 | 6.9 | 9.1 |
| None | 0.9 | 2.5 | 10.5 |
| % of households where main shopper is White British** $ | 78.8 | 83.3 | 83.4 |
| Region - London * (%) | 23.5 | 17.5 | 12.7 |
| Midlands (%) | 15.5 | 14.9 | 16.0 |
| North East (%) | 3.5 | 5.0 | 6.1 |
| Yorkshire (%) | 11.0 | 13.5 | 12.7 |
| Lancashire (%) | 10.0 | 11.6 | 11.4 |
| South (%) | 10.1 | 9.7 | 10.1 |
| Scotland (%) | 8.3 | 8.1 | 10.0 |
| East of England (%) | 7.7 | 8.6 | 8.4 |
| Wales and West of England (%) | 8.4 | 8.2 | 8.8 |
| South West (%) | 2.1 | 3.0 | 3.6 |

Note: *individual level characteristic; **household level characteristic; $4-5% of the sample did not report; standard deviations in brackets

Table 2. Average annual expenditure for take-home and out-of-home purchases of foods and beverages (per capita/week)

| | | 2015 | | 2016 | | 2017 | |
|---|---|---|---|---|---|---|---|
| **SES** | **Expenditure** | **£ [95% CI]** | **%** | **£ [95% CI]** | **%** | **£ [95% CI]** | **%** |
| High-SES | Take-home | 29.73 [29.50;29.95] | | 28.28 [28.06;28.50] | | 29.89 [29.66;30.12] | |
| | Out-of-home | 16.21 [15.04;17.38] | 35.1 | 14.64 [13.49;15.79] | 34.1 | 15.11 [14.26; 15.96] | 33.6 |
| Mid-SES | Take-home | 26.41 [26.28;26.55] | | 26.45 [26.31;26.58] | | 28.11 [27.96;28.26] | |
| | Out-of-home | 15.91 [15.27;16.55] | 37.3 | 16.35 [15.79;16.91] | 38.2 | 17.76 [17.05;18.48] | 38.7 |
| Low-SES | Take-home | 24.11 [23.91;24.30] | | 23.42 [23.24;23.61] | | 24.94 [24.73;25.15] | |
| | Out-of-home | 8.07 [7.48;8.66] | 25.0 | 9.15 [8.57;9.73] | 28.1 | 9.69 [9.04;10.34] | 28.0 |
| Total | Take-home | 26.55 [26.45;26.65] | | 26.08 [25.98;26.18] | | 27.67 [27.56;27.78] | |
| | Out-of-home | 13.81 [13.36;14.26] | 34.0 | 13.97 [13.55;14.40] | 34.9 | 14.87 [14.43;15.31] | 35.0 |

Note: excludes purchases of alcohol for out-of-home consumption; take-home expenditure is estimated based on Kantar Worldpanel take-home panel for the same time period between June 2015 and Dec 2017. Inflation-adjusted (June 2015 =100)

Table 3. Socio-demographic determinants of annual expenditure share of different out-of-home outlets

| | Cafes and restaurants | | | Fast-food and takeaway | | | Supermarkets and convenience stores | | | Other | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Coef** | **95% CI** | | **Coef** | **95% CI** | | **Coef** | **95% CI** | | **Coef** | **95% CI** | |
| High-SES | ref | | | ref | | | ref | | | ref | | |
| Mid-SES | -0.035 | -0.049 | -0.019 | 0.024 | 0.014 | 0.035 | 0.016 | 0.001 | 0.030 | -0.004 | -0.015 | 0.009 |
| Low-SES | -0.071 | -0.090 | -0.051 | 0.073 | 0.057 | 0.089 | 0.018 | -0.001 | 0.037 | -0.018 | -0.035 | -0.004 |
| Deg. or higher | ref | | | ref | | | ref | | | ref | | |
| Higher ed. (below degree) | -0.035 | -0.050 | -0.022 | 0.021 | 0.009 | 0.033 | 0.011 | -0.003 | 0.025 | 0.002 | -0.010 | 0.015 |
| A Level | -0.031 | -0.046 | -0.015 | 0.020 | 0.007 | 0.033 | 0.012 | -0.006 | 0.026 | -0.002 | -0.014 | 0.012 |
| GCSE | -0.045 | -0.061 | -0.031 | 0.031 | 0.017 | 0.045 | 0.005 | -0.010 | 0.021 | 0.010 | -0.003 | 0.022 |
| Other/Unknown | -0.027 | -0.047 | -0.005 | 0.028 | 0.011 | 0.047 | 0.007 | -0.011 | 0.028 | -0.008 | -0.025 | 0.010 |
| None | -0.050 | -0.079 | -0.021 | 0.007 | -0.017 | 0.030 | 0.028 | 0.000 | 0.058 | 0.015 | -0.010 | 0.039 |
| Age 12 to 18 | -0.085 | -0.112 | -0.060 | -0.059 | -0.082 | -0.032 | 0.091 | 0.062 | 0.119 | 0.047 | 0.024 | 0.072 |
| 19 to 29 | ref | | | ref | | | ref | | | ref | | |
| 30-39 | 0.025 | 0.008 | 0.041 | -0.011 | -0.026 | 0.005 | -0.024 | -0.041 | -0.006 | 0.010 | -0.004 | 0.025 |
| 40-49 | 0.040 | 0.022 | 0.058 | -0.039 | -0.054 | -0.021 | -0.024 | -0.043 | -0.004 | 0.022 | 0.006 | 0.038 |
| 50-59 | 0.075 | 0.055 | 0.095 | -0.059 | -0.074 | -0.039 | -0.039 | -0.058 | -0.017 | 0.022 | 0.005 | 0.040 |
| 60-69 | 0.153 | 0.127 | 0.176 | -0.093 | -0.110 | -0.075 | -0.054 | -0.080 | -0.030 | -0.006 | -0.024 | 0.013 |
| 70 and over | 0.211 | 0.176 | 0.244 | -0.109 | -0.129 | -0.085 | -0.079 | -0.109 | -0.052 | -0.022 | -0.044 | 0.003 |
| Female | ref | | | ref | | | ref | | | ref | | |
| Male | -0.075 | -0.088 | -0.063 | -0.002 | -0.013 | 0.007 | 0.035 | 0.022 | 0.047 | 0.042 | 0.030 | 0.052 |
| HH size | -0.019 | -0.024 | -0.014 | -0.005 | -0.009 | 0.000 | 0.013 | 0.007 | 0.017 | 0.010 | 0.006 | 0.015 |
| HH - no children | ref | | | ref | | | ref | | | ref | | |
| HH - children | 0.000 | -0.016 | 0.014 | 0.052 | 0.039 | 0.065 | -0.019 | -0.035 | -0.006 | -0.030 | -0.041 | -0.017 |
| London | ref | | | ref | | | ref | | | ref | | |
| Midlands | 0.006 | -0.015 | 0.025 | 0.022 | 0.004 | 0.036 | -0.060 | -0.080 | -0.039 | 0.033 | 0.018 | 0.049 |
| North East | -0.028 | -0.058 | 0.004 | 0.017 | -0.007 | 0.041 | -0.051 | -0.080 | -0.016 | 0.065 | 0.041 | 0.094 |
| Yorkshire | -0.017 | -0.041 | 0.003 | 0.031 | 0.013 | 0.047 | -0.057 | -0.077 | -0.036 | 0.043 | 0.026 | 0.063 |
| Lancashire | -0.024 | -0.046 | -0.004 | 0.027 | 0.010 | 0.044 | -0.053 | -0.074 | -0.029 | 0.050 | 0.032 | 0.069 |
| South | 0.001 | -0.024 | 0.025 | -0.011 | -0.030 | 0.007 | -0.010 | -0.032 | 0.016 | 0.018 | -0.001 | 0.037 |
| Scotland | -0.045 | -0.069 | -0.021 | 0.027 | 0.007 | 0.048 | -0.046 | -0.070 | -0.021 | 0.063 | 0.039 | 0.082 |
| East of England | -0.010 | -0.034 | 0.014 | 0.005 | -0.014 | 0.025 | -0.029 | -0.055 | -0.003 | 0.034 | 0.013 | 0.054 |
| Wales and West of England | -0.015 | -0.038 | 0.009 | 0.018 | -0.002 | 0.037 | -0.045 | -0.068 | -0.021 | 0.040 | 0.021 | 0.061 |
| South West | -0.021 | -0.057 | 0.013 | 0.001 | -0.025 | 0.030 | -0.026 | -0.067 | 0.018 | 0.044 | 0.013 | 0.078 |
| Year dummies | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | |
| Constant | 0.458 | 0.428 | 0.485 | 0.190 | 0.167 | 0.214 | 0.223 | 0.195 | 0.253 | 0.130 | 0.106 | 0.152 |
| **RE parameters** | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | |
| Var(intercept) | 0.072 | 0.001 | | 0.045 | 0.001 | | 0.078 | 0.002 | | 0.048 | 0.001 | |
| Var(residual) | 0.029 | 0.001 | | 0.023 | 0.001 | | 0.026 | 0.001 | | 0.023 | 0.001 | |
| **Log likelihood** | -1538 | | | 1773 | | | -997 | | | 1561 | | |
| **Wald test** | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | |
| SES | 57.5 | 0.000 | | 90.6 | 0.000 | | 5.7 | 0.057 | | 5.8 | 0.054 | |
| Education | 44.0 | 0.000 | | 29.9 | 0.000 | | 6.1 | 0.299 | | 6.8 | 0.239 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Age | 377.3 | 0.000 | 161.0 | 0.000 | 115.1 | 0.000 | 38.6 | 0.000 |
| Region | 24.5 | 0.004 | 33.1 | 0.000 | 58.0 | 0.000 | 65.9 | 0.000 |

*Notes: Classification of outlets is detailed in Table S1 in supplemental files. Results are from a maximally adjusted (to variables in the table) linear multilevel model with random intercepts to account for clustering at individual level. Confidence intervals calculated from bootstrapped standard errors (1000 replications). Shaded cells indicate where the confidence intervals do not overlap with zero. HH - household*

Table 4. Socio-demographic determinants of annual expenditure shares of foods and beverages purchases for out-of-home consumption

| | Main meals | | | Quick meals | | | Cold non-alcoholic beverages | | | Sweet snacks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Coef** | **95% CI** | | **Coef** | **95% CI** | | **Coef** | **95% CI** | | **Coef** | **95% CI** | |
| High-SES | ref | | | ref | | | ref | | | ref | | |
| Mid-SES | 0.003 | -0.010 | 0.017 | 0.004 | -0.006 | 0.013 | 0.009 | 0.003 | 0.016 | -0.003 | -0.011 | 0.006 |
| Low-SES | 0.024 | 0.007 | 0.042 | -0.010 | -0.024 | 0.003 | 0.015 | 0.006 | 0.025 | 0.005 | -0.006 | 0.017 |
| Deg. or higher | ref | | | ref | | | ref | | | ref | | |
| Higher ed. (below degree) | -0.006 | -0.021 | 0.007 | 0.007 | -0.003 | 0.016 | 0.009 | 0.001 | 0.016 | -0.005 | -0.014 | 0.005 |
| A Level | -0.003 | -0.018 | 0.011 | 0.016 | 0.005 | 0.027 | 0.006 | -0.003 | 0.014 | -0.006 | -0.015 | 0.003 |
| GCSE | 0.005 | -0.010 | 0.021 | 0.001 | -0.010 | 0.012 | 0.010 | 0.002 | 0.019 | -0.003 | -0.013 | 0.007 |
| Other/Unknown | 0.010 | -0.010 | 0.030 | -0.001 | -0.016 | 0.014 | 0.009 | -0.001 | 0.021 | -0.001 | -0.014 | 0.012 |
| None | -0.024 | -0.051 | 0.002 | 0.019 | 0.000 | 0.039 | -0.001 | -0.015 | 0.015 | 0.006 | -0.011 | 0.025 |
| Age 12 to 18 | -0.077 | -0.100 | -0.053 | -0.023 | -0.041 | -0.001 | 0.035 | 0.016 | 0.055 | 0.074 | 0.054 | 0.097 |
| 19 to 29 | ref | | | ref | | | ref | | | ref | | |
| 30-39 | 0.009 | -0.008 | 0.024 | 0.008 | -0.003 | 0.020 | -0.019 | -0.030 | -0.008 | -0.012 | -0.023 | 0.001 |
| 40-49 | -0.014 | -0.030 | 0.004 | 0.027 | 0.014 | 0.040 | -0.037 | -0.049 | -0.027 | -0.009 | -0.021 | 0.002 |
| 50-59 | -0.006 | -0.022 | 0.015 | 0.027 | 0.013 | 0.042 | -0.060 | -0.071 | -0.050 | -0.005 | -0.017 | 0.007 |
| 60-69 | 0.001 | -0.020 | 0.023 | 0.016 | 0.001 | 0.033 | -0.083 | -0.095 | -0.072 | -0.002 | -0.015 | 0.012 |
| 70 and over | 0.014 | -0.014 | 0.039 | -0.008 | -0.026 | 0.009 | -0.088 | -0.100 | -0.075 | -0.005 | -0.021 | 0.013 |
| Female | ref | | | ref | | | ref | | | ref | | |
| Male | -0.031 | -0.044 | 0.019 | 0.029 | 0.020 | 0.038 | 0.007 | 0.001 | 0.013 | -0.006 | -0.013 | 0.002 |
| HH size | -0.019 | -0.024 | -0.014 | -0.001 | -0.005 | 0.002 | 0.004 | 0.001 | 0.007 | 0.010 | 0.007 | 0.013 |
| HH – no children | ref | | | ref | | | ref | | | ref | | |
| HH - children | 0.033 | 0.018 | 0.049 | -0.013 | -0.024 | -0.003 | 0.009 | 0.001 | 0.017 | -0.004 | -0.014 | 0.004 |
| London | ref | | | ref | | | ref | | | ref | | |
| Midlands | 0.035 | 0.015 | 0.055 | -0.010 | -0.023 | 0.004 | -0.003 | -0.014 | 0.007 | -0.005 | -0.015 | 0.008 |
| North East | 0.018 | -0.014 | 0.044 | 0.006 | -0.015 | 0.028 | -0.005 | -0.017 | 0.011 | 0.007 | -0.009 | 0.027 |
| Yorkshire | 0.037 | 0.013 | 0.059 | -0.005 | -0.019 | 0.009 | 0.007 | -0.003 | 0.018 | -0.003 | -0.015 | 0.012 |
| Lancashire | 0.028 | 0.009 | 0.050 | 0.004 | -0.012 | 0.018 | 0.000 | -0.011 | 0.011 | -0.004 | -0.017 | 0.009 |
| South | -0.010 | -0.034 | 0.012 | -0.008 | -0.024 | 0.007 | 0.001 | -0.012 | 0.013 | 0.012 | -0.002 | 0.026 |
| Scotland | 0.012 | -0.011 | 0.034 | 0.006 | -0.010 | 0.023 | 0.013 | 0.000 | 0.027 | 0.002 | -0.012 | 0.019 |
| East of England | 0.005 | -0.017 | 0.031 | 0.004 | -0.013 | 0.021 | -0.003 | -0.015 | 0.009 | 0.004 | -0.010 | 0.018 |
| Wales and West of England | 0.019 | -0.005 | 0.041 | -0.007 | -0.022 | 0.008 | 0.009 | -0.003 | 0.022 | 0.003 | -0.011 | 0.019 |
| South West | 0.003 | -0.035 | 0.037 | 0.009 | -0.014 | 0.035 | -0.018 | -0.034 | 0.000 | 0.015 | -0.008 | 0.039 |
| Year dummies | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | |
| Constant | 0.376 | 0.348 | 0.403 | 0.173 | 0.156 | 0.194 | 0.126 | 0.112 | 0.141 | 0.090 | 0.075 | 0.107 |
| **RE parameters** | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | |
| Var(intercept) | 0.066 | 0.001 | | 0.031 | 0.001 | | 0.018 | 0.001 | | 0.025 | 0.001 | |
| Var(residual) | 0.025 | 0.001 | | 0.016 | 0.000 | | 0.009 | 0.000 | | 0.012 | 0.001 | |
| **Log likelihood** | -123 | | | 5489 | | | 10948 | | | 8008 | | |
| **Wald test** | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | |
| SES | 9.5 | 0.009 | | 6.5 | 0.039 | | 10.0 | 0.007 | | 2.8 | 0.250 | |
| Education | 8.7 | 0.123 | | 14.1 | 0.015 | | 9.9 | 0.079 | | 3.3 | 0.658 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Age | 55.6 | <0.001 | 51.7 | <0.001 | 346.7 | <0.001 | 116.9 | <0.001 |
| Region | 33.5 | <0.001 | 9.2 | 0.419 | 16.4 | 0.060 | 10.0 | 0.348 |

*Notes: Classification of food groups is detailed in table S2 in supplemental file. Results are from a maximally adjusted (to variables in the table) linear multilevel model with random intercepts to account for clustering at individual level. Confidence intervals calculated from bootstrapped standard errors (1000replications). Shaded cells indicate where the confidence intervals do not overlap with zero. HH- household*

Table 4 cont. Socio-demographic determinants of annual expenditure shares of foods and beverages purchases for out-of-home consumption

| | Savoury snacks | | | Hot beverages | | | Fruit and vegetables | | | Other | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Coef** | **95% CI** | | **Coef** | **95% CI** | | **Coef** | **95% CI** | | **Coef** | **95% CI** | |
| High-SES | ref | | | ref | | | ref | | | ref | | |
| Mid-SES | -0.001 | -0.005 | 0.002 | -0.014 | -0.024 | -0.003 | 0.000 | -0.003 | 0.003 | 0.002 | -0.001 | 0.004 |
| Low-SES | -0.002 | -0.008 | 0.003 | -0.031 | -0.046 | -0.017 | -0.003 | -0.007 | 0.001 | 0.002 | -0.002 | 0.006 |
| Deg. or higher | ref | | | ref | | | ref | | | ref | | |
| Higher ed. (below degree) | 0.000 | -0.003 | 0.005 | -0.006 | -0.016 | 0.004 | 0.000 | -0.002 | 0.003 | 0.002 | -0.001 | 0.005 |
| A Level | 0.001 | -0.003 | 0.004 | -0.011 | -0.022 | 0.000 | -0.001 | -0.004 | 0.002 | -0.001 | -0.004 | 0.002 |
| GCSE | 0.005 | 0.001 | 0.010 | -0.017 | -0.028 | -0.007 | -0.001 | -0.004 | 0.002 | 0.000 | -0.002 | 0.004 |
| Other/Unknown | 0.001 | -0.003 | 0.006 | -0.020 | -0.033 | -0.007 | 0.001 | -0.003 | 0.006 | 0.001 | -0.003 | 0.004 |
| None | 0.011 | 0.001 | 0.023 | -0.012 | -0.033 | 0.009 | 0.001 | -0.003 | 0.007 | 0.001 | -0.003 | 0.005 |
| Age 12 to 18 | 0.020 | 0.011 | 0.030 | -0.031 | -0.046 | -0.014 | 0.001 | -0.006 | 0.008 | 0.005 | 0.000 | 0.012 |
| 19 to 29 | ref | | | ref | | | ref | | | ref | | |
| 30-39 | 0.001 | -0.003 | 0.006 | 0.013 | 0.001 | 0.025 | -0.001 | -0.006 | 0.003 | 0.000 | -0.003 | 0.003 |
| 40-49 | 0.000 | -0.005 | 0.005 | 0.034 | 0.022 | 0.047 | -0.003 | -0.008 | 0.001 | 0.000 | -0.004 | 0.003 |
| 50-59 | -0.004 | -0.010 | 0.002 | 0.053 | 0.037 | 0.069 | -0.006 | -0.010 | -0.001 | -0.001 | -0.005 | 0.002 |
| 60-69 | -0.009 | -0.016 | -0.003 | 0.089 | 0.071 | 0.107 | -0.008 | -0.013 | -0.003 | -0.007 | -0.011 | -0.003 |
| 70 and over | -0.014 | -0.021 | -0.008 | 0.112 | 0.089 | 0.138 | -0.013 | -0.017 | -0.008 | -0.007 | -0.012 | -0.003 |
| Female | ref | | | ref | | | ref | | | ref | | |
| Male | 0.005 | 0.002 | 0.008 | -0.004 | -0.014 | 0.007 | -0.002 | -0.004 | 0.001 | 0.003 | 0.001 | 0.005 |
| HH size | 0.000 | -0.001 | 0.002 | 0.004 | 0.000 | 0.008 | 0.001 | 0.000 | 0.002 | 0.000 | -0.001 | 0.001 |
| HH – no children | ref | | | ref | | | ref | | | ref | | |
| HH - children | -0.003 | -0.007 | 0.000 | -0.018 | -0.028 | -0.006 | -0.004 | -0.007 | 0.000 | 0.000 | -0.003 | 0.003 |
| London | ref | | | ref | | | ref | | | ref | | |
| Midlands | -0.008 | -0.014 | -0.003 | 0.000 | -0.015 | 0.016 | -0.006 | -0.010 | -0.002 | -0.006 | -0.009 | -0.002 |
| North East | -0.009 | -0.017 | 0.001 | -0.008 | -0.030 | 0.015 | -0.006 | -0.012 | 0.001 | -0.003 | -0.008 | 0.003 |
| Yorkshire | -0.007 | -0.013 | -0.002 | -0.019 | -0.034 | -0.003 | -0.008 | -0.012 | -0.004 | -0.004 | -0.008 | -0.001 |
| Lancashire | -0.007 | -0.013 | -0.002 | -0.011 | -0.028 | 0.006 | -0.007 | -0.012 | -0.002 | -0.002 | -0.006 | 0.002 |
| South | -0.007 | -0.013 | -0.002 | 0.019 | -0.001 | 0.037 | -0.005 | -0.009 | 0.000 | -0.002 | -0.006 | 0.002 |
| Scotland | -0.003 | -0.010 | 0.004 | -0.021 | -0.039 | -0.004 | -0.006 | -0.010 | 0.001 | -0.002 | -0.006 | 0.002 |
| East of England | -0.004 | -0.010 | 0.003 | 0.003 | -0.013 | 0.020 | -0.008 | -0.011 | -0.004 | -0.002 | -0.006 | 0.004 |
| Wales and West of England | -0.011 | -0.017 | -0.005 | -0.004 | -0.021 | 0.015 | -0.005 | -0.010 | 0.001 | -0.002 | -0.007 | 0.002 |
| South West | -0.010 | -0.017 | 0.000 | 0.008 | -0.020 | 0.042 | -0.001 | -0.008 | 0.010 | -0.004 | -0.009 | 0.002 |
| Year dummies | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | |
| Constant | 0.028 | 0.021 | 0.037 | 0.172 | 0.152 | 0.193 | 0.022 | 0.017 | 0.028 | 0.012 | 0.006 | 0.017 |
| **RE parameters** | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | |
| Var(intercept) | 0.004 | 0.000 | | 0.041 | 0.001 | | 0.003 | 0.000 | | 0.002 | 0.000 | |
| Var(residual) | 0.002 | 0.000 | | 0.013 | 0.000 | | 0.002 | 0.000 | | 0.001 | 0.000 | |
| **Log likelihood** | 25080 | | | 5588 | | | 28262 | | | 30648 | | |
| **Wald test** | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | |
| SES | 1.0 | 0.617 | | 20.0 | <0.001 | | 3.4 | 0.187 | | 2.7 | 0.264 | |
| Education | 13.6 | 0.018 | | 13.8 | 0.017 | | 1.9 | 0.865 | | 2.6 | 0.760 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Age | 68.0 | <0.001 | 207.5 | <0.001 | 23.4 | <0.001 | 21.6 | 0.001 |
| Region | 21.5 | 0.011 | 26.6 | 0.002 | 19.8 | 0.019 | 10.4 | 0.318 |

*Notes: Classification of food groups is detailed in table S2 in supplemental file. Results are from a maximally adjusted (to variables in the table) linear multilevel model with random intercepts to account for clustering at individual level. Confidence intervals calculated from bootstrapped standard errors (1000replications). Shaded cells indicate where the confidence intervals do not overlap with zero. HH- household*

Table 4. Socio-demographic determinants of annual expenditure shares of foods and beverages purchases for out-of-home consumption

| | Main meals | | | Quick meals | | | Cold non-alcoholic beverages | | | Sweet snacks | | | Savoury snacks | | | Hot beverages | | | Fruit and vegetables | | | Other | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coef | 95% CI | | Coef | 95% CI | | Coef | 95% CI | | Coef | 95% CI | | Coef | 95% CI | | Coef | 95% CI | | Coef | 95% CI | | Coef | 95% CI | |
| High-SES | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | |
| Mid-SES | 0.003 | -0.010 | 0.017 | 0.004 | -0.006 | 0.013 | 0.009 | 0.003 | 0.016 | -0.003 | -0.011 | 0.006 | -0.001 | -0.005 | 0.002 | -0.014 | -0.024 | -0.003 | 0.000 | -0.003 | 0.003 | 0.002 | -0.001 | 0.004 |
| Low-SES | 0.024 | 0.007 | 0.042 | -0.01 | -0.024 | 0.003 | 0.015 | 0.006 | 0.025 | 0.005 | -0.006 | 0.017 | -0.002 | -0.008 | 0.003 | -0.031 | -0.046 | -0.017 | -0.003 | -0.007 | 0.001 | 0.002 | -0.002 | 0.006 |
| Deg. or higher | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | |
| Higher ed. (below degree) | -0.006 | -0.021 | 0.007 | 0.007 | -0.003 | 0.016 | 0.009 | 0.001 | 0.016 | -0.005 | -0.014 | 0.005 | 0 | -0.003 | 0.005 | -0.006 | -0.016 | 0.004 | 0 | -0.002 | 0.003 | 0.002 | -0.001 | 0.005 |
| A Level | -0.003 | -0.018 | 0.011 | 0.016 | 0.005 | 0.027 | 0.006 | -0.003 | 0.014 | -0.006 | -0.015 | 0.003 | 0.001 | -0.003 | 0.004 | -0.011 | -0.022 | 0 | -0.001 | -0.004 | 0.002 | -0.001 | -0.004 | 0.002 |
| GCSE | 0.005 | -0.01 | 0.021 | 0.001 | -0.010 | 0.012 | 0.01 | 0.002 | 0.019 | -0.003 | -0.013 | 0.007 | 0.005 | 0.001 | 0.01 | -0.017 | -0.028 | -0.007 | -0.001 | -0.004 | 0.002 | 0 | -0.002 | 0.004 |
| Other/Unknown | 0.01 | -0.01 | 0.03 | -0.001 | -0.016 | 0.014 | 0.009 | -0.001 | 0.021 | -0.001 | -0.014 | 0.012 | 0.001 | -0.003 | 0.006 | -0.02 | -0.033 | -0.007 | 0.001 | -0.003 | 0.006 | 0.001 | -0.003 | 0.004 |
| None | -0.024 | -0.051 | 0.002 | 0.019 | 0 | 0.039 | -0.001 | -0.015 | 0.015 | 0.006 | -0.011 | 0.025 | 0.011 | 0.001 | 0.023 | -0.012 | -0.033 | 0.009 | 0.001 | -0.003 | 0.007 | 0.001 | -0.003 | 0.005 |
| Age 12 to 18 | -0.077 | -0.100 | -0.053 | -0.023 | -0.041 | -0.001 | 0.035 | 0.016 | 0.055 | 0.074 | 0.054 | 0.097 | 0.02 | 0.011 | 0.03 | -0.031 | -0.046 | -0.014 | 0.001 | -0.006 | 0.008 | 0.005 | 0 | 0.012 |
| 19 to 29 | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | |
| 30-39 | 0.009 | -0.008 | 0.024 | 0.008 | -0.003 | 0.02 | -0.019 | -0.030 | -0.008 | -0.012 | -0.023 | 0.001 | 0.001 | -0.003 | 0.006 | 0.013 | 0.001 | 0.025 | -0.001 | -0.006 | 0.003 | 0.000 | -0.003 | 0.003 |
| 40-49 | -0.014 | -0.030 | 0.004 | 0.027 | 0.014 | 0.040 | -0.037 | -0.049 | -0.027 | -0.009 | -0.021 | 0.002 | 0 | -0.005 | 0.005 | 0.034 | 0.022 | 0.047 | -0.003 | -0.008 | 0.001 | 0.000 | -0.004 | 0.003 |
| 50-59 | -0.006 | -0.022 | 0.015 | 0.027 | 0.013 | 0.042 | -0.06 | -0.071 | -0.050 | -0.005 | -0.017 | 0.007 | -0.004 | -0.010 | 0.002 | 0.053 | 0.037 | 0.069 | -0.006 | -0.010 | -0.001 | -0.001 | -0.005 | 0.002 |
| 60-69 | 0.001 | -0.020 | 0.023 | 0.016 | 0.001 | 0.033 | -0.083 | -0.095 | -0.072 | -0.002 | -0.015 | 0.012 | -0.009 | -0.016 | -0.003 | 0.089 | 0.071 | 0.107 | -0.008 | -0.013 | -0.003 | -0.007 | -0.011 | -0.003 |
| 70 and over | 0.014 | -0.014 | 0.039 | -0.008 | -0.026 | 0.009 | -0.088 | -0.100 | -0.075 | -0.005 | -0.021 | 0.013 | -0.014 | -0.021 | -0.008 | 0.112 | 0.089 | 0.138 | -0.013 | -0.017 | -0.008 | -0.007 | -0.012 | -0.003 |
| Female | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | |
| Male | -0.031 | -0.044 | 0.019 | 0.029 | 0.020 | 0.038 | 0.007 | 0.001 | 0.013 | -0.006 | -0.013 | 0.002 | 0.005 | 0.002 | 0.008 | -0.004 | -0.014 | 0.007 | -0.002 | -0.004 | 0.001 | 0.003 | 0.001 | 0.005 |
| HH size | -0.019 | -0.024 | -0.014 | -0.001 | -0.005 | 0.002 | 0.004 | 0.001 | 0.007 | 0.01 | 0.007 | 0.013 | 0 | -0.001 | 0.002 | 0.004 | 0 | 0.008 | 0.001 | 0 | 0.002 | 0 | -0.001 | 0.001 |
| HH – no children | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | |
| HH - children | 0.033 | 0.018 | 0.049 | -0.013 | -0.024 | -0.003 | 0.009 | 0.001 | 0.017 | -0.004 | -0.014 | 0.004 | -0.003 | -0.007 | 0 | -0.018 | -0.028 | -0.006 | -0.004 | -0.007 | 0 | 0 | -0.003 | 0.003 |
| London | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | | ref | | |
| Midlands | 0.035 | 0.015 | 0.055 | -0.010 | -0.023 | 0.004 | -0.003 | -0.014 | 0.007 | -0.005 | -0.015 | 0.008 | -0.008 | -0.014 | -0.003 | 0 | -0.015 | 0.016 | -0.006 | -0.010 | -0.002 | -0.006 | -0.009 | -0.002 |
| North East | 0.018 | -0.014 | 0.044 | 0.006 | -0.015 | 0.028 | -0.005 | -0.017 | 0.011 | 0.007 | -0.009 | 0.027 | -0.009 | -0.017 | 0.001 | -0.008 | -0.030 | 0.015 | -0.006 | -0.012 | 0.001 | -0.003 | -0.008 | 0.003 |
| Yorkshire | 0.037 | 0.013 | 0.059 | -0.005 | -0.019 | 0.009 | 0.007 | -0.003 | 0.018 | -0.003 | -0.015 | 0.012 | -0.007 | -0.013 | -0.002 | -0.019 | -0.034 | -0.003 | -0.008 | -0.012 | -0.004 | -0.004 | -0.008 | -0.001 |
| Lancashire | 0.028 | 0.009 | 0.050 | 0.004 | -0.012 | 0.018 | 0 | -0.011 | 0.011 | -0.004 | -0.017 | 0.009 | -0.007 | -0.013 | -0.002 | -0.011 | -0.028 | 0.006 | -0.007 | -0.012 | -0.002 | -0.002 | -0.006 | 0.002 |
| South | -0.01 | -0.034 | 0.012 | -0.008 | -0.024 | 0.007 | 0.001 | -0.012 | 0.013 | 0.012 | -0.002 | 0.026 | -0.007 | -0.013 | -0.002 | 0.019 | -0.001 | 0.037 | -0.005 | -0.009 | 0 | -0.002 | -0.006 | 0.002 |
| Scotland | 0.012 | -0.011 | 0.034 | 0.006 | -0.010 | 0.023 | 0.013 | 0 | 0.027 | 0.002 | -0.012 | 0.019 | -0.003 | -0.010 | 0.004 | -0.021 | -0.039 | -0.004 | -0.006 | -0.010 | 0.001 | -0.002 | -0.006 | 0.002 |
| East of England | 0.005 | -0.017 | 0.031 | 0.004 | -0.013 | 0.021 | -0.003 | -0.015 | 0.009 | 0.004 | -0.01 | 0.018 | -0.004 | -0.010 | 0.003 | 0.003 | -0.013 | 0.020 | -0.008 | -0.011 | -0.004 | -0.002 | -0.006 | 0.004 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wales and West of England | 0.019 | -0.005 | 0.041 | -0.007 | -0.022 | 0.008 | 0.009 | -0.003 | 0.022 | 0.003 | -0.011 | 0.019 | -0.011 | -0.017 | -0.005 | -0.004 | -0.021 | 0.015 | -0.005 | -0.010 | 0.001 | -0.002 | -0.007 | 0.002 |
| South West | 0.003 | -0.035 | 0.037 | 0.009 | -0.014 | 0.035 | -0.018 | -0.034 | 0 | 0.015 | -0.008 | 0.039 | -0.01 | -0.017 | 0 | 0.008 | -0.020 | 0.042 | -0.001 | -0.008 | 0.010 | -0.004 | -0.009 | 0.002 |
| Year dummies | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | | *Incl.* | | |
| Constant | 0.376 | 0.348 | 0.403 | 0.173 | 0.156 | 0.194 | 0.126 | 0.112 | 0.141 | 0.09 | 0.075 | 0.107 | 0.028 | 0.021 | 0.037 | 0.172 | 0.152 | 0.193 | 0.022 | 0.017 | 0.028 | 0.012 | 0.006 | 0.017 |
| **RE parameters** | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | | *Coef.* | *BS SE* | |
| Var(intercept) | 0.066 | 0.001 | | 0.031 | 0.001 | | 0.018 | 0.001 | | 0.025 | 0.001 | | 0.004 | 0 | | 0.041 | 0.001 | | 0.003 | 0 | | 0.002 | 0 | |
| Var(residual) | 0.025 | 0.001 | | 0.016 | 0 | | 0.009 | 0 | | 0.012 | 0.001 | | 0.002 | 0 | | 0.013 | 0 | | 0.002 | 0 | | 0.001 | 0 | |
| **Log likelihood** | -123 | | | 5489 | | | 10948 | | | 8008 | | | 25080 | | | 5588 | | | 28262 | | | 30648 | | |
| **Wald test** | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | | $\chi^2$ | *p-val* | |
| SES | 9.5 | 0.009 | | 6.5 | 0.039 | | 10 | 0.007 | | 2.8 | 0.25 | | 1 | 0.617 | | 20 | <0.001 | | 3.4 | 0.187 | | 2.7 | 0.264 | |
| Education | 8.7 | 0.123 | | 14.1 | 0.015 | | 9.9 | 0.079 | | 3.3 | 0.658 | | 13.6 | 0.018 | | 13.8 | 0.017 | | 1.9 | 0.865 | | 2.6 | 0.76 | |
| Age | 55.6 | <0.001 | | 51.7 | <0.001 | | 346.7 | <0.001 | | 116.9 | <0.001 | | 68 | <0.001 | | 207.5 | <0.001 | | 23.4 | <0.001 | | 21.6 | 0.001 | |
| Region | 33.5 | <0.001 | | 9.2 | 0.419 | | 16.4 | 0.06 | | 10 | 0.348 | | 21.5 | 0.011 | | 26.6 | 0.002 | | 19.8 | 0.019 | | 10.4 | 0.318 | |

*Notes: Classification of outlets is detailed in Table S1 in supplemental files. Results are from a maximally adjusted (to variables in the table) linear multilevel model with random intercepts to account for clustering at individual level. Confidence intervals calculated from bootstrapped standard errors (1000 replications). Shaded cells indicate where the confidence intervals do not overlap with zero. HH - household*

Figure 1. Purchases of out-of-home foods and beverages by outlet type

*Figure 1A*

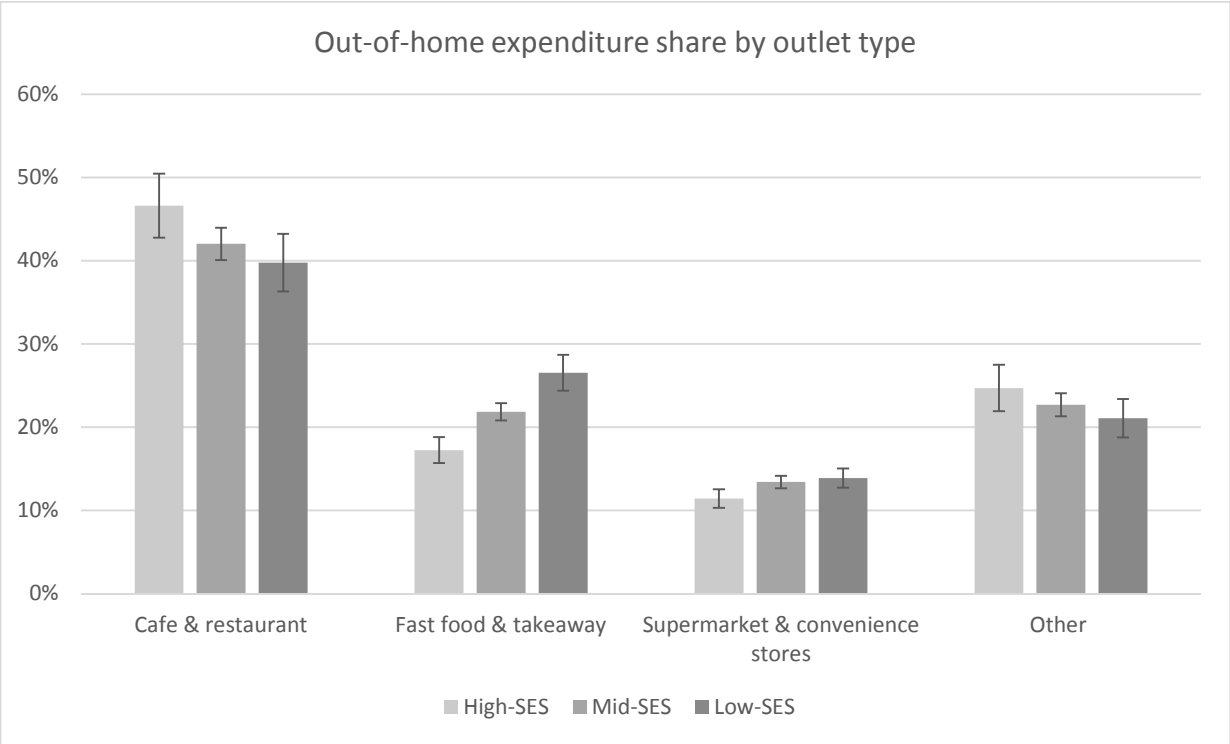
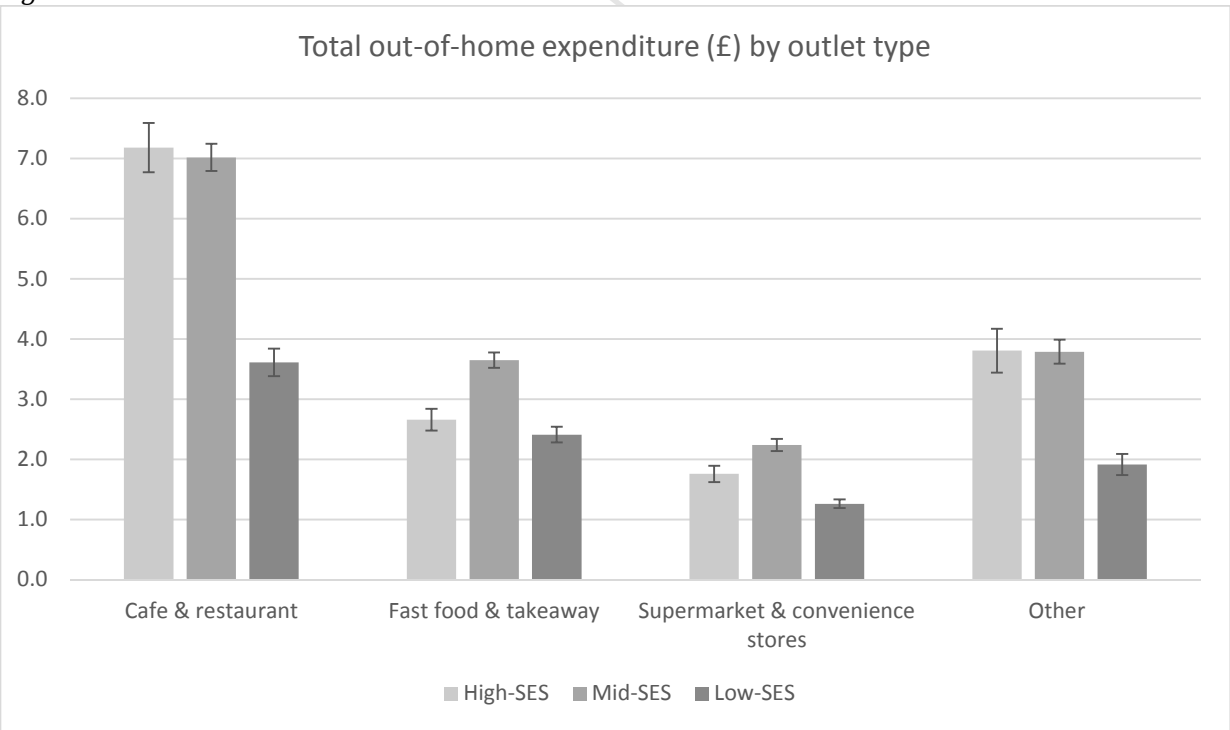



*Figure 1B*




*Notes: Inflation-adjusted (June 2015=100); cluster-robust standard errors. Weighted average population-level per capita expenditure share and expenditure for out-of-home consumption (Jun 2015-Dec 2017)*

Figure 2. Purchases of foods and beverages for out-of-home consumption

*Figure 2A*

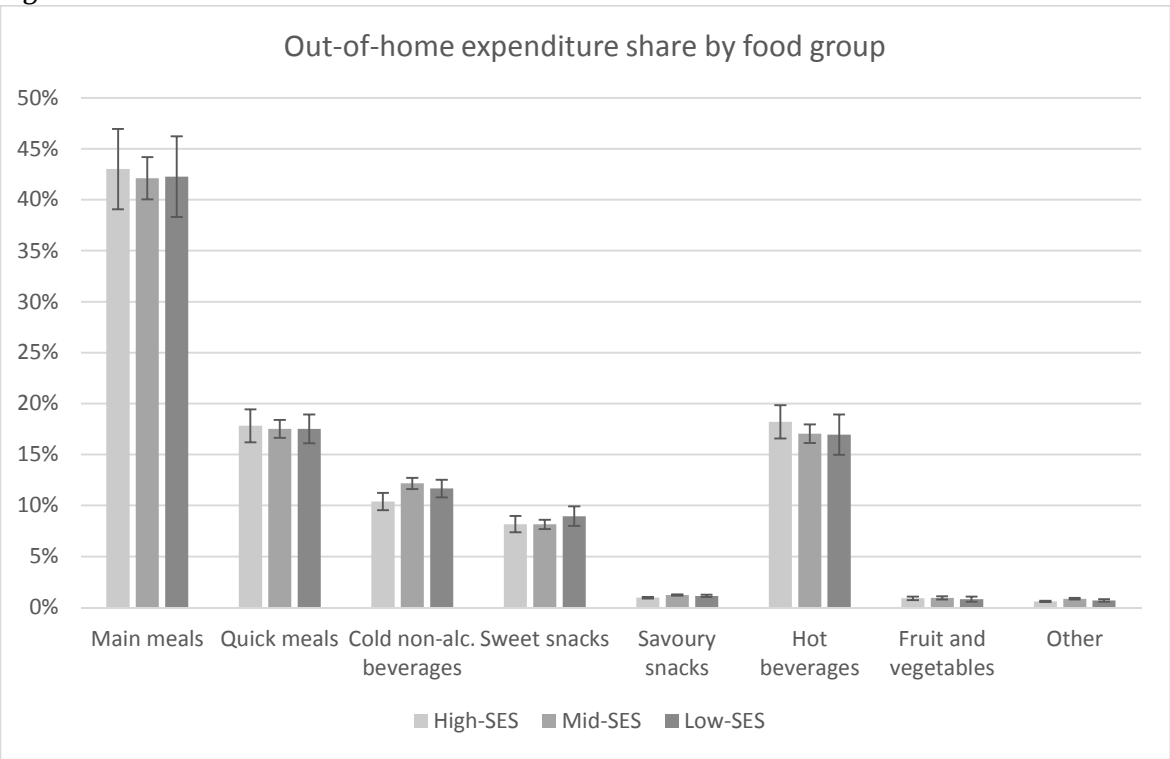
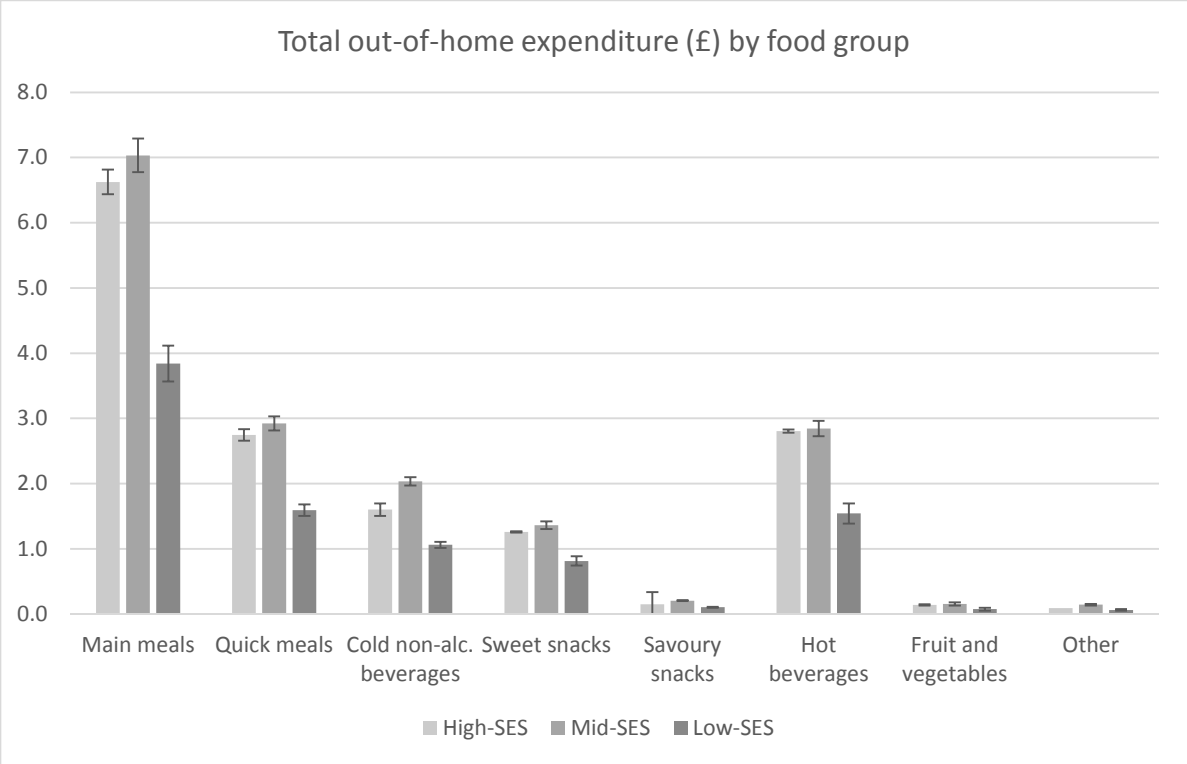



*Figure 2B*




*Notes: Adjusted to inflation (June 2015=100); cluster-robust standard errors. Weighted average population-level per capita expenditure share and expenditure for out-of-home consumption (Jun 2015-Dec 2017)*

Figure 3. Frequency of purchases of foods and beverages for out-of-home consumption

*Figure 3A*

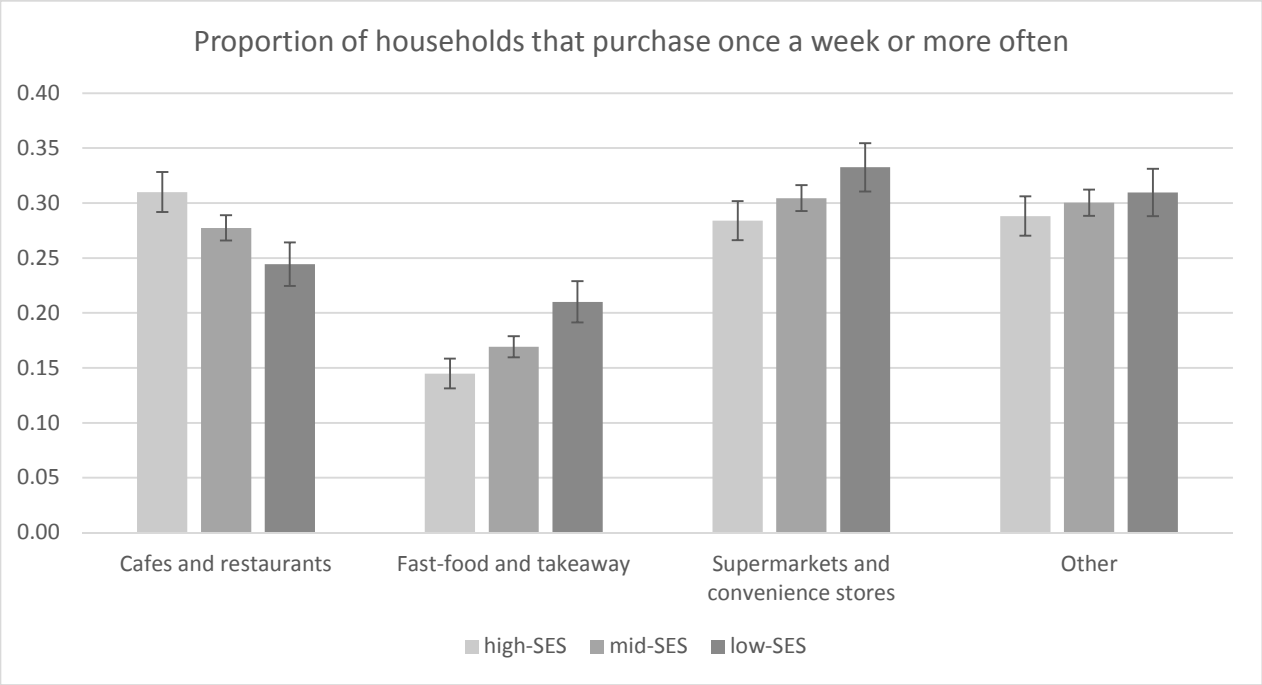
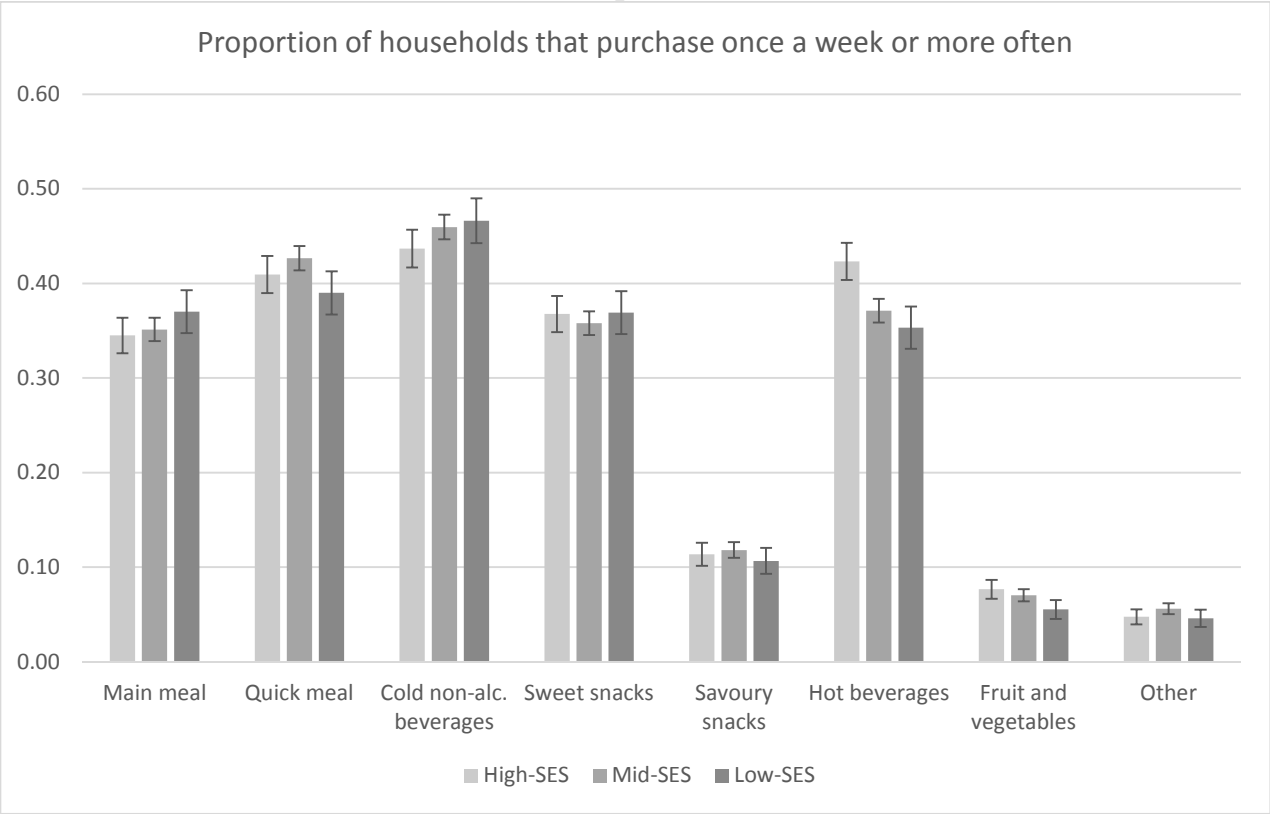



*Figure 3B*




*Notes: Cluster-robust standard errors; remaining respondents purchased less frequently.*

**Highlights**

- Out-of-home (OOH) purchases make up 25-39% of food and non-alcoholic beverage spend
- Mid- and high-SES group spend more on OOH foods compared to low-SES group
- Beyond meals, 38-39% of OOH expenditures are spent on drinks and snacks
- Low-, mid-SES group spent relatively more on fast food and takeaway and soft drinks
- High-SES groups spend relatively more in restaurants and cafes and on hot beverages