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Abstract

Objective: A quantitative analysis of expenditure on all fresh foods, fruit & vegetables (F&V) and fish, across urban and rural households in Scotland. Fresh foods were chosen since, in general, they are perceived to contribute more to health than processed foods.
Design: Descriptive analysis of purchase data of all foods brought into the home during 2012 from the Kantar Worldpanel database. Purchase data were restricted to fresh, unprocessed and raw foods, or 'fresh to frozen' foods where freezing was part of harvesting. Total household purchases were adjusted for household size and composition.
Setting. Scotland.
Subjects. 2576 households.
Results. Rural households reported the highest expenditure per person on fresh foods and F&V, but also bought the most (kg) of these items. There was a linear trend of average prices paid with urban/rural location ($p<0.001$), with average prices paid by large urban and remote rural households for fresh food (£2.14/kg and £2.04/kg), F&V (£1.64/kg and £1.60/kg) and fish purchases (£10.07/kg and £10.20/kg), although differences were quantitatively small.
Conclusion. Contrary to previous studies, purchase data show that access to, and average prices of fresh foods generally, and F&V and fish specifically, are broadly similar between urban and rural areas. Therefore, the higher expenditure on these foods in rural versus urban areas is probably due to factors other than pricing and availability.

Key words: purchasing behaviour, rural-urban, fresh foods, shopping

Introduction

A recent report concluded that households in remote rural Scotland require higher incomes to attain the same minimum acceptable living standard as those living elsewhere in the UK [1]. This was, in part, due to the higher cost of certain types of products and services including food. In support of this, Dawson et al. [2] reported that the average price of a basket of 35 'healthy' products including fruits, vegetables, low-fat dairy products and high carbohydrate and protein items across Scotland was highest in rural compared to urban areas. Higher purchase costs are often reported as a perceived barrier to adopting healthier diets [3]. Healthier diets do tend to be more expensive than less healthy diets [4], partly because fresh fruits and vegetables, which comprise a large component of a healthy diet, are expensive compared to energy dense, highly processed foods [5].

In addition, availability of healthy foods may be fundamental to adopting healthier diets by consumer groups. The term 'food-deserts' refers to areas of the country where consumers have limited access to healthier food choices [6]. Although their existence in the UK has been disputed, spatial variations in access to healthy foods in terms of availability of products as well as price do exist [2]. This appears to be especially true for rural areas, where absence of retail provision can create significant difficulties for consumers to access healthy food. In rural areas, the distance that householders have to travel for food retail shopping is greater than in urban areas [7], and therefore, most rural households use their closest major supermarket to shop once a week or once a month, whereas local convenience stores and small shops are often considered as a source of secondary shopping [8]. However, access to supermarkets does generally improve the availability of healthy food, in addition to lowering prices [6,9].

Fresh foods are defined as those that have not undergone any processing and are therefore in their raw state. Assessing access to, and average prices of fresh food is important considering that this is perceived as a healthier option compared to processed or preserved food for a number of reasons. These include lower salt levels and potentially higher nutrient levels. Indeed, processed red meats may contain up to four times more salt than fresh meats [10], perhaps explaining why fresh meat consumption has a low correlation with incidence of cardiovascular disease (CVD), whereas consumption of processed meat is positively linked to CVD [11]. In addition, consumption of fresh and frozen fruit and vegetables is linked to reduced risk of mortality, CVD [12] and cancers of the pharynx, lung, mouth, stomach and oesophagus [13]. Also, consumption of fish products and the marine fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) is associated with a lower risk of CVD [14].

In this study, therefore, we have examined whether there are differences in expenditure on fresh food products generally, or on fruits and vegetables and fish specifically, between urban and rural areas of Scotland. Note that, in defining fresh foods, some ‘fresh to frozen’ foods were also included where freezing was considered an essential part of harvesting and where the nutritional quality of these foods is considered similar to the unfrozen equivalent. Furthermore, we investigated whether purchasing behaviour differed according to outlet type or differences in household income or other socioeconomic factors across regions.

Methods

Data from Kantar Worldpanel (KWP; www.kantarworldpanel.com/en) were used for this investigation. The KWP includes around 3000 households in Scotland, who report food and drink purchases brought into the home. Purchases that were reported between the 26th December 2011 and the 23rd December 2012 (364 days) were included in the analyses. Information recorded on products included barcode data, purchaser (household) code, store and product price. Data on non-barcoded items such as fresh foods were collected using barcoded show cards (photographs) and questions. Data were not included for foods consumed outside the home (such as dining out), home grown food and food items received as gifts. UK census data and the Broadcasters' Audience Research Panel Establishment Survey were used to define and predict demographic targets and to monitor the national representativeness of KWP. Compliance with scanning was encouraged by frequent postal, e-mail, or telephone reminders.

For each household, data on household composition, income band (sum of family income before tax), urban-rural classification (UR6) and the degree of the area's deprivation using the Scottish Index of Multiple Deprivation (SIMD) were available, with the latter two based on the households' post code. This investigation focused on entries from all Scottish households of the KWP for which an urban-rural classification was available (2576 households and 6733 people (adults plus children). Only purchases of fresh food items, which included fresh fruits, vegetables (including pre-packed salads), eggs, meats and fish and excluded any items that were processed, tinned, bottled, smoked, salted, breaded or cooked, were selected. Some "fresh to frozen" items were included if freezing was an essential part of harvesting, as were some fish and vegetable products. These included, for example, frozen prawns and fish fillets, and frozen vegetables such as peas, sweetcorn and carrots. The dataset of fresh food products purchased had a total of 577,382 entries. Within this dataset, 476,712 entries (83%) related to purchases of fruits and vegetables, and 17,065 entries (3%) related to purchases of fresh fish products.

Household composition within KWP varies by the number of people and their ages, therefore the amount of food needed to be bought each week will also vary. To account for this, expenditure, amount and number of packs of fresh produce were scaled by the estimated energy requirements of the household members to give equivalized values. These were estimated from the sex and age of each individual, and linked to the Dietary Reference Values for Energy [15]. The total estimated energy requirement for each household was calculated from the sum of the individual values per household, and divided by 10.45MJ (2500kcal) to give an adult equivalent value.

Household location was assessed using the Scottish Government's Urban Rural 6-Fold Classification (UR6 1-6) (Table 1). 95% of Scottish geographical areas are defined as rural, housing almost 19% (13.1% accessible rural, 5.6% remote rural) of the population. Based on this, Scotland is classified as a mostly rural country. Household income was coded into categories, with £0-£9,999 (as Band 1), £10,000-£19,999 (Band 2), £20,000-£29,999 (Band 3), £30,000-£39,999 (Band 4), £40,000-£49,999 (Band 5), £50,000-£59,999 (Band 6), £60,000-£69,999 (Band 7), and £70,000+pa (Band 8). The SIMD combines 27 indicators across 7 domains (income, employment, health, education, skills and training, housing, geographic access and crime). The overall index is a weighted sum of the seven domain scores. The domain weightings used in SIMD 2012, expressed as a % of the overall weight are: current income (28%), employment (28%), health (14%), education (14%), geographic access (9%), crime (5%) and housing (2%). It collects data from 6,505 small areas (data zones) that cover Scotland and classifies them as most deprived (ranked 1) to least deprived (ranked 6505). In this study, households were grouped based on their home postcode into deciles of deprivation with those least deprived ranked 10. Life stage included households with no children (1), family with children aged 0-4 years (2), family with children aged 5-9 years (3), family with children aged 10+ years (4), family with older dependents (5), households where all children had recently left (6) and retired people (7).

Statistical analyses were conducted using SPSS Version 23 (SPSS/IBM Corp, Armonk, New York, NY). ANOVA was used to test for differences in demographic characteristics, expenditure and amounts of foods purchased by urban/rural area classification. Kruskal-Wallis tests were used to compare the distribution of life stage, and income band, across UR6 groupings. Simple linear regression was used to test for associations between expenditure, amounts of foods, and number of packs purchased as outcome variables, with urban/rural classification as the predictor variable. Microsoft Excel (2010) pivot tables were used for descriptive data analysis. In the calculations, the total number of individuals in a household was defined as the number of adults (age 18 or above) plus the number of children (age 17 or below). Seasons were classified as winter (26th December 2011 – 25th March 2012), spring (26th March 2012 – 24th June 2012), summer (25th June 2012 –23rd September 2012) and autumn (24th September 2012 – 23rd December 2012). Shopping venues were classified into major supermarket brands (ASDA, Co-op, Morrisons, Mark and Spencer, Sainsbury's, Tesco and Waitrose), internet major supermarket brands, discount supermarkets (Aldi, Costco, Lidl and Iceland), corner shops and other local shops (Best One, Budgens, Costcutter, FarmFoods, Londis, Mace, Nisa Today, newsagents, off-licence shops, butcher, bakery, fish monger, One stop, Premier Stores, Tesco metro, Sainsbury's local, Market stalls and Spar) and other shops (all stores that sell non-food as a main product).

Results

Most of the reporting households (69%) were located in urban areas (UR6 1 and UR6 2), whilst 13% of households were in small towns (UR6 3 and UR6 4) and 18% in rural areas (UR6 5 and UR6 6) (Table 2). 10% of reporting households were in remote areas and had to drive for 30 minutes or more to a settlement of >10,000 people. UR6 1 (large urban) had the lowest number of people per household, and the lowest number of children per household, whereas UR6 4 (remote small towns) had the highest number of people and children per household. The distribution of life stage was not significantly different across UR6 groups (p=0.169), or between urban and rural households (p=0.081). There was a higher proportion of households with lower income bands in rural than more urban areas (p=0.003). On average, households in UR6 3 (accessible small towns) and UR6 5 (accessible rural areas) lived in less deprived areas, whereas households in UR6 1 (large urban) lived in more deprived areas (Table 2).

Across the urban-rural categories from UR6 1 through to UR6 6, there was a significant linear increase in both weekly expenditure (in £) and in amounts (in kg) of total fresh foods and fruit & vegetables bought per adult equivalent (Table 3). Consequently, rural households (UR6 5 or UR6 6) recorded the highest expenditure, and bought the most amounts, of these products. Overall, expenditure on vegetables was approximately 20% higher than that spent on fruits. Household expenditure on, and amount bought of fish was more variable and did not differ greatly between UR6 categories. This variability probably originates from the fact that not all households purchased fish products – only 68%, 66%, 68%, 65%, 73% and 74% of households reported any fish purchases throughout the year in UR6 1 to UR6 6, respectively. Across UR6 categories, expenditure was highest on oily fish, but in general, greater amounts of white fish were purchased, especially in rural households (Table 3). Mean per adult equivalent weekly expenditure on fresh foods, fruits and vegetables, and fish differed across the seasons (p=0.003, p<0.001 and p=0.011 respectively), but there was no significant interaction between season and UR6 (Figure 1). A similar pattern was also seen for the amounts of fresh foods, fruits and vegetables, and fish bought (p=0.136, p=0.005 and p=0.009 respectively, Figure 2). For the amount of fish bought there was a significant interaction between season and UR6 (p=0.036).
Expenditure per kg and per item were both significantly different (p < 0.001) across UR6 categories, and there were significant linear trends for decreasing expenditure per kg and increasing expenditure per item from large urban to remote rural areas (p < 0.001). The differences were, however, quantitatively small (Table 4).

The majority of fresh food, fruits & vegetables and fish purchases were carried out in major supermarkets, even by households in remote rural locations (Table 5). Only the proportions of expenditure through on-line shopping on fresh foods, and fruits and vegetables differed significantly by location, with the proportion of expenditure increasing linearly from large urban to remote rural areas ($p < 0.001$ for both). On-line expenditure was quantitatively small even by remote rural households.

Discussion

The main finding of the current study was that households in rural areas (UR6 5 and UR6 6) reported the highest expenditure on fresh foods and on fruits & vegetables, compared to other regions. Purchasing patterns of fish were more variable mainly due to smaller sample sizes, as a consequence of only a subset of consumers buying fish and therefore, no clear differences in fish purchasing patterns between urban and rural areas were found. Overall, these findings are in agreement with those reported by Wrieden et al. [(16)], who found a higher mean consumption of fresh fruit and vegetables, oily and white fish, and fresh potatoes in subjects living in remote small towns/rural/very remote rural areas compared with more urban areas, based on expenditure and food survey data. Similarly, Levin et al. [(17)] showed that young people from rural areas reported the highest weekly intake of fruit and vegetables across Scotland.

Although we found that expenditure on all fresh foods, and on fruits & vegetables, in rural areas (UR6 5 and UR6 6) was higher compared with urban areas (UR6 1-4), this appeared to be a result of purchasing more of these food items, rather than paying more per item. Average prices per pack or average prices per kg across fresh food, fruits & vegetables and fish purchases were quantitatively similar, although differences were statistically significant, across all UR6 categories with decreasing cost per kg in more rural areas (Table 4). This disagrees with findings in some previous studies. Indeed, Dawson et al [(2)] found that the cost of a basket of healthy products including fruit and vegetables and fish was highest in rural versus urban locations, with costs of £46.68 and £43.60 in affluent rural and affluent urban, and £52.75 and £43.87 in deprived rural and deprived urban areas respectively (late 2005/early 2006 prices). The discrepancy may be explained by different foods being bought by urban and rural households in the current study, which did not include a direct like-for-like price comparison. Additionally, Hirsh et al [(1)] recently reported that food prices were about 10% higher in supermarkets in remote rural Scotland and considerably more than this in local stores, although this was in comparison to prices for a rural English town. This latter study also reported that remote rural households mixed supermarket shopping with local top-ups, spending 10-20% more on a food basket compared with urban British households, whilst in the most remote island communities, reliance only on local stores could add over 50% to the total food budget [(1)]. The difference between the current study and some of the older studies may be explained by the fact that most rural households now have easier access to large supermarkets, either directly or through internet shopping as supported by the current findings that similar levels of relative spend on fresh food items were reported in rural and urban locations. The growth of online retailing has had a profound effect on island residents in improving access to goods [18], and presumably also had a similar effect on remote rural mainland households. Indeed, 99% of both rural and urban households in this study reported at least some expenditure in major supermarket outlets, and the percentage of shopping carried out through the internet was 2-3 times higher in rural versus urban areas (Table 5). We did find, however, that rural households reported a higher amount of purchases from local shops compared with urban households, but this did not result in major differences in the average price per kg of fresh food bought across UR6 categories. Both the retail market and food marketing has changed significantly over the last 10 years, with an increasing number of larger supermarkets opening in various locations including out-of-town, making them readily available to the population, a phenomena also reported by Clarke and Banga [19]. This generally leads to greater price competition with lower prices, wider choices, and better quality across retail outlets [6,9]. Therefore, the current findings provide evidence that differences in spatial access to healthy food, at least those concerning fresh food purchases, may have become less prevalent throughout Scotland.

We considered expenditure based on season, as availability and price may vary over a year. Indeed, many different fruits and vegetables are harvested at different times of the year [20], but modern storage and transport systems now allow an almost continuous flow of produce throughout the year, at least for products such as apples, onions and lettuce [21]. Other items, such as berries, are more readily available and cheaper in season [22]. Slightly higher expenditure on all fresh foods, and fruits and vegetables was evident in summer, across all UR6 categories, and a similar difference was also seen in greater amounts of these foods being bought during summer.

Our data do not explain why, in general, households in rural communities buy more fresh foods compared with those in urban communities. Households in urban areas tend to eat out (e.g. in restaurants or take-away food) more than do rural households [23], which is not captured in the data used in the current analyses. Therefore, rural households may be more likely to report higher amounts of food and drink brought into the home than urban households, even if total consumption is similar. Furthermore, a study from Sayer [24] indicated that an older population in rural areas has a higher consumption of fresh products as well as having more time for cooking, which may contribute towards a higher household expenditure for fresh foods. However, in the current study, the distribution of household life stage was not greatly different in rural versus the other UR6 categories. There may be differences between urban and rural households in the contribution of home grown fresh food to the diet, although in the UK, in 2012, this together with all other sources of free food (such as gifts) only averaged 2.7% of all fresh fruit and vegetables entering the home. Free eggs contributed 5.0% of the total amount of eggs [23].

There was a higher proportion of households with lower income bands in rural than more urban areas, yet expenditure on fresh foods, and fruit and vegetables was higher per person in rural areas. This is in contrast to the observation of Pateman [25] that high income households residing in rural Britain spent the most on fresh healthy foods, and other studies reporting a positive correlation between higher socioeconomic background and highest expenditure on fresh foods [26]. However, comparisons between studies should be based on the use of equivalized income values (i.e. household incomes that are adjusted for household size and composition) rather than income bands as used by KWP. Indeed, a higher household income band recorded by KWP does not necessarily mean more money being available per person for buying food. Multiple studies have investigated how deprivation shapes accessibility, availability and affordability of fruit and vegetables [27,28,29,30]. Cummins and colleagues [31] pioneered research into deprivation and food accessibility in Scotland and since then a growing body of literature has supported the correlation between deprivation and food accessibility [32,33], although some other studies have found the opposite trend, i.e. greater healthy food availability in more deprived areas [34,28]. The most recent estimation of food intake from food purchase data in Scotland (2010-2012) [35] shows a clear gradient in fruit and vegetable consumption by SIMD quintile - in the most deprived quintile, mean daily consumption was 205g/day compared with 311g/day in the least deprived quintile across 2010 to 2012. Consumption of oil rich fish was also highest in the least deprived quintile with mean weekly consumption of 39.2g/week compared to 19.0g/week in the most deprived. However, this difference was due to fewer consumers of oil rich fish in the most deprived quintile, rather than lower intakes by consumers [35]. Our data indicate that the majority of consumers have access to fresh foods generally, and to fruits and vegetables and fish specifically. Therefore, lower purchasing levels may be determined more by food choice, (including differences in the amount of food eaten outside the home), and affordability as lower income households spend a greater proportion of their income on food than do more affluent households, than by availability and differences in price faced by consumers.

Limitations

The present study is subject to a number of limitations. The KWP panel may differ to some extent from the general population as they report lower household incomes, are more likely to be middle aged and have a greater proportion of multiple-adult households compared to households participating in the Living Costs and Food Survey [36]. Also, there is evidence that not all food purchases that are brought into the home are recorded by panel members, with fruit and fish of the food groups appearing to be particularly affected, when compared to reporting in the Living Costs and Food Survey [36]. Therefore, the amounts of produce reported are likely to be underestimates across the UR6 categories.

Conclusions

In conclusion, this study showed that access to, and average price of, fresh foods in general, and fruits, vegetables and fish in particular, are broadly similar between household living in urban and rural areas. It was found that households in rural areas (UR6 5 and UR6 6) spent the most, and bought the most amounts of fresh food products, amongst which are fruits & vegetables and fish. Intervention policies to increase consumption of fresh foods should therefore be mostly targeted at large urban areas and accessible small towns where the lowest purchases on fresh food products (UR6 1 and UR6 3) occur.

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Table 1. Scottish Government 6 fold Urban Rural Classification

UR6 1 Large Urban Areas	Settlements of > 125,000 people
UR6 2 Other Urban Areas	Settlements of 10,000 - 125,000 people
UR6 3 Accessible Small Towns	Settlements of 3,000 - 10,000 people; <30 minutes' drive of a settlement >10,000 people
UR6 4 Remote Small Towns	Settlements of 3,000 - 10,000 people; >30 minutes' drive of a settlement >10,000 people
UR6 5 Accessible Rural	Settlement of <3,000 people; <30 minutes' drive of a settlement >10,000 people
UR6 6 Remote Rural	Settlement <3,000 people; >30 minutes' drive of a settlement >10,000 people

Table 2. Household composition and deprivation status across UR6 categories.

	UR6 1 Large urban areas	UR6 2 Other urban areas	UR6 3 Accessible small towns	UR6 4 Remote small towns	UR6 5 Accessible rural	UR6 6 Remote rural	P ANOVA	P Linear trend
Total number of households	860	909	206	110	339	152	-	-
Percentage of total households	33%	35%	8%	4%	13%	6%	-	-
Total number of people	1630	1771	416	214	694	311	-	-
Number of people/household	2.5 (2.4;2.5)	2.7 (2.6;2.7)	2.7 (2.6;2.8)	2.8 (2.7;2.9)	2.7 (2.6;2.8)	2.8 (2.7;2.8)	0.001	<0.001
Number of adults/household	1.9 (1.8;1.9)	1.9 (1.9;2.0)	2.0 (2.0;2.1)	1.9 (1.9;2.0)	2.0 (2.0;2.1)	2.0 (2.1;2.2)	0.072	0.003
Number of children/household	0.6 (0.5;0.6)	0.7 (0.6;0.8)	0.7 (0.6;0.8)	0.8 (0.8;0.9)	0.7 (0.6;0.7)	0.7 (0.6;0.8)	0.007	0.007
SIMD	5.1 (4.9;5.3)	5.4 (5.2;5.6)	6.2 (6.0;6.4)	5.3 (5.1;5.4)	6.3 (6.2;6.4)	5.8 (5.6;5.9)	<0.001	<0.001

Data are represented as means ± 95% CI.

Table 3. Average weekly expenditure on fresh* foods, fruits & vegetables and fish, and amount and number of packs of fresh foods, fruits & vegetables and fish bought per adult equivalent.

	UR6 1 Large urban areas	UR6 2 Other urban areas	UR6 3 Accessible small towns	UR6 4 Remote small towns	UR6 5 Accessible rural	UR6 6 Remote rural	P ANOVA	P Linear trend
Fresh foods								
Expenditure (£)	4.60 (4.48;4.71)	4.33 (4.22;4.45)	4.32 (4.18;4.45)	4.24 (4.12;4.35)	4.78 (4.62;4.94)	4.81 (4.65;4.98)	<0.001	<0.001
Amount (kg)	2.1 (2.1;2.2)	2.1 (2.1;2.2)	2.1 (2;2.1)	2.2 (2.1;2.2)	2.3 (2.3;2.4)	2.4 (2.3;2.4)	<0.001	<0.001
# of packs	5.0 (4.9;5.1)	4.6 (4.4;4.7)	4.5 (4.4;4.7)	4.5 (4.4;4.7)	5.0 (4.9;5.2)	5.0 (4.9;5.2)	<0.001	0.003
Fruit & vegetables								
Expenditure (£)	3.25 (3.17;3.32)	3.01 (2.94;3.08)	3.09 (2.99;3.19)	3.09 (2.99;3.19)	3.42 (3.31;3.53)	3.53 (3.4;3.65)	<0.001	<0.001
Amount (kg)	1.8 (1.8;1.8)	1.8 (1.7;1.8)	1.8 (1.7;1.8)	1.8 (1.8;1.9)	2.0 (1.9;2)	2.0 (2;2.1)	<0.001	<0.001
# of packs	4.4 (4.4;4.5)	4.1 (4.0;4.2)	4.1 (3.9;4.2)	4.1 (4.0;4.2)	4.6 (4.5;4.7)	4.5 (4.4;4.7)	<0.001	<0.001
Expenditure on fruit : vegetables	1 : 1.2	1 : 1.2	1 : 1.2	1 : 1.3	1 : 1.2	1 : 1.2		
Amount fruit : vegetables bought	1 : 1.4	1 : 1.4	1: 1.5	1 : 1.6	1: 1.5	1 : 1.6		
Fish								

Expenditure(£)	0.33	0.28	0.31	0.23	0.30	0.31	<0.001	0.230
	(0.31;0.35)	(0.27;0.30)	(0.29;0.33)	(0.21;0.26)	(0.28;0.32)	(0.29;0.34)		
Amount (g)	33.1	28.1	31.5	24.3	31.6	31.2	<0.001	0.470
	(31.4;34.8)	(26.9;29.4)	(29.1;33.9)	(21.9;26.6)	(29.7;33.4)	(28.7;33.6)		
# of packs	0.12	0.09	0.10	0.09	0.10	0.10	<0.001	0.020
	(0.11;0.12)	(0.09;0.10)	(0.09;0.11)	(0.08;0.09)	(0.09;0.10)	(0.09;0.11)		
Expenditure on white fish : oily fish : shellfish : other fish								
	8 : 10 : 4 : 1	10 : 13 : 7 : 1	13 : 13 : 7 : 1	11 : 16 : 10 : 1	7 : 8 : 4 : 1	3 : 6 : 3 : 1		
Amount white fish : oily fish : shellfish : other fish bought								
	7 : 8 : 4 : 1	9 : 9 : 5 : 1	11 : 11 : 6 : 1	12 : 10 : 7 : 1	7 : 5 : 3 : 1	13 : 5 : 3 : 1		

Data are represented as means ± 95%CI. *Some 'fresh to frozen' products were included in the analysis where freezing was considered an essential part of harvesting and where the nutritional quality of these foods is considered similar to the unfrozen equivalent.

Table 4. Average expenditure per kg and per item of fresh* food, fruits & vegetable and fish, purchased by households across UR6 categories

	UR6 1 Large urban areas	UR6 2 Other urban areas	UR6 3 Accessible small towns	UR6 4 Remote small towns	UR6 5 Accessible rural	UR6 6 Remote rural	P ANOVA	P Linear trend
Fresh foods								
Expenditure/kg (£)	2.14 (2.09;2.19)	2.05 (2.00-2.10)	2.07 (2.00;2.13)	1.96 (1.91;2.02)	2.05 (1.98;2.11)	2.04 (1.97;2.11)	<0.001	<0.001
Expenditure/item (£)	0.93 (0.90;0.96)	0.95 (0.92;0.98)	0.96 (0.92;1.00)	0.94 (0.89;0.99)	0.95 (0.91;0.99)	0.96 (0.92;1.00)	<0.001	<0.001
Fruits & vegetables								
Expenditure/kg (£)	1.64 (1.60;1.69)	1.56 (1.52;1.60)	1.60 (1.54;1.66)	1.56 (1.51;1.62)	1.59 (1.5;1.64)	1.60 (1.55;1.66)	<0.001	<0.001
Expenditure/item (£)	0.67 (0.66;0.70)	0.69 (0.66;0.72)	0.71 (0.67;0.75)	0.72 (0.67;0.76)	0.70 (0.66;0.74)	0.73 (0.69;0.76)	<0.001	<0.001
Fish								
Expenditure/kg (£)	10.07 (9.77;10.37)	10.10 (9.77;10.43)	9.95 (9.38;10.51)	9.69 (8.97;10.40)	9.55 (9.07;10.02)	10.20 (9.46;10.94)	<0.001	<0.001
Expenditure/item (£)	2.87 (2.76;2.98)	3.07 (2.97;3.18)	3.09 (2.87;3.31)	3.02 (2.87;3.16)	3.07 (2.90;3.23)	3.10 (2.88;3.31)	<0.001	<0.001

Data are represented as means ± 95%CI. *Some 'fresh to frozen' products were included in the analysis where freezing was considered an essential part of harvesting and where the nutritional quality of these foods is considered similar to the unfrozen equivalent.

Table 5. Expenditure on fresh* foods, fruits & vegetables and fish per shop type

	UR6 1 Large urban areas	UR6 2 Other urban areas	UR6 3 Accessible small towns	UR6 4 Remote small towns	UR6 5 Accessible rural	UR6 6 Remote rural	P ANOVA
Expenditure on fresh foods per shop type (% of total)							
Major supermarket brands	80.4%	76.2%	73.1%	77.0%	75.0%	74.3%	0.153
Internet (major supermarket brands)	3.5%	3.8%	7.0%	5.1%	7.9%	8.0%	0.001
Discount supermarkets	11.1%	13.9%	13.9%	12.0%	12.6%	11.1%	0.079
Corner shops/local shops	4.8%	5.8%	5.8%	5.8%	4.3%	6.3%	0.531
Other shops	0.3%	0.2%	0.3%	0.2%	0.2%	0.2%	0.269
Expenditure on fruits & vegetables per shop type (% of total)							
Major supermarket brands	83.8%	79.0%	75.2%	77.1%	77.9%	76.4%	0.059
Internet (major supermarket brands)	3.4%	4.1%	6.9%	4.9%	7.7%	8.6%	<0.001
Discount supermarkets	9.8%	13.1%	13.8%	11.9%	12.4%	10.9%	0.127
Corner shops/local shops	2.9%	3.7%	3.9%	6.0%	1.9%	3.9%	0.250
Greengrocer/Fruiterer	*0.4%*	*0.3%*	*0.7%*	*1.8%*	*0.7%*	*0.2%*	*0.197*
Other shops	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.141
Expenditure on fish per shop type (% of total)							
Major supermarket brands	78.6%	73.2%	69.1%	73.8%	74.7%	68.0%	0.645
Internet (major supermarket brands)	3.1%	2.2%	9.5%	2.7%	5.6%	6.1%	0.190
Discount supermarkets	9.4%	12.0%	9.6%	17.2%	10.7%	10.5%	0.183
Corner shops/local shops	8.6%	12.0%	11.8%	6.3%	8.9%	14.9%	0.593

Fish monger	*3.7%*	*7.7%*	*9.0%*	*3.3%*	*5.5%*	*12.0%*	*0.769*
Other shops	0.3%	0.5%	0.1%	0.1%	0.1%	0.4%	0.751

Major supermarket brands (ASDA, Co-op, Morrisons, Mark and Spencer, Sainsbury's, Tesco and Waitrose), internet major supermarket brands, discount supermarkets (Aldi, Costco, Lidl and Iceland), corner shops and other local shops (Best One, Budgens, Costcutter, FarmFoods, Londis, Mace, Nisa Today, newsagents, off-licence shops, butcher, bakery, fish monger, One stop, Premier Stores, Tesco metro, Sainsbury's local, Market stalls and Spar) and other shops (all stores that sell non-food as a main product). *Some 'fresh to frozen' products were included in the analysis where freezing was considered an essential part of harvesting and where the nutritional quality of these foods is considered similar to the unfrozen equivalent.

Figure legends

Figure 1. Average weekly expenditure (£ per adult equivalent) on fresh foods (A), fruits & vegetables (B) and fish (C) per adult equivalent during winter, spring, summer and autumn.

Figure 2. Average weekly amount (kg per adult equivalent) of fresh foods (A), fruits & vegetables (B) and fish (C) bought per adult equivalent during winter, spring, summer and autumn.

Figure 1

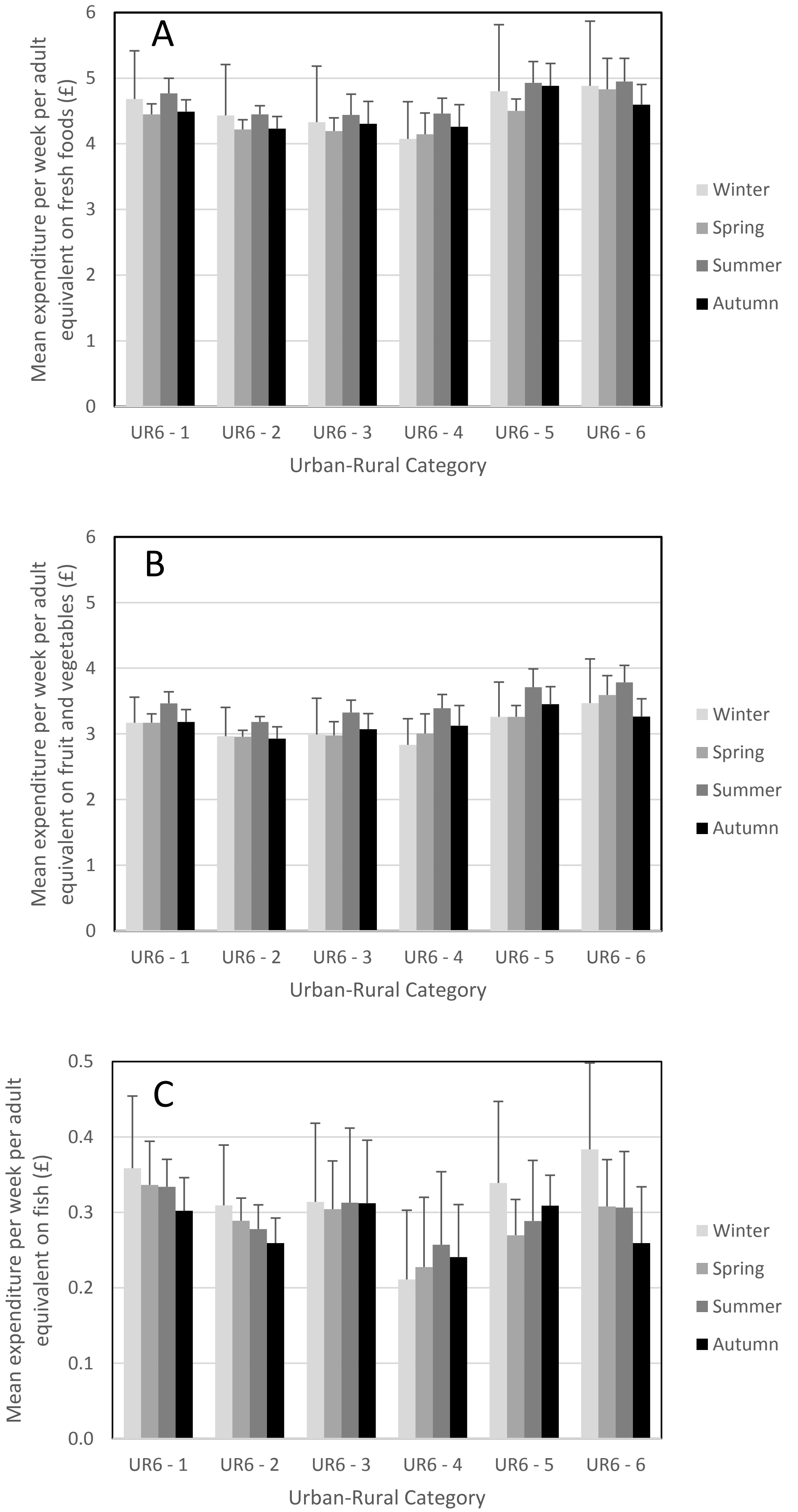
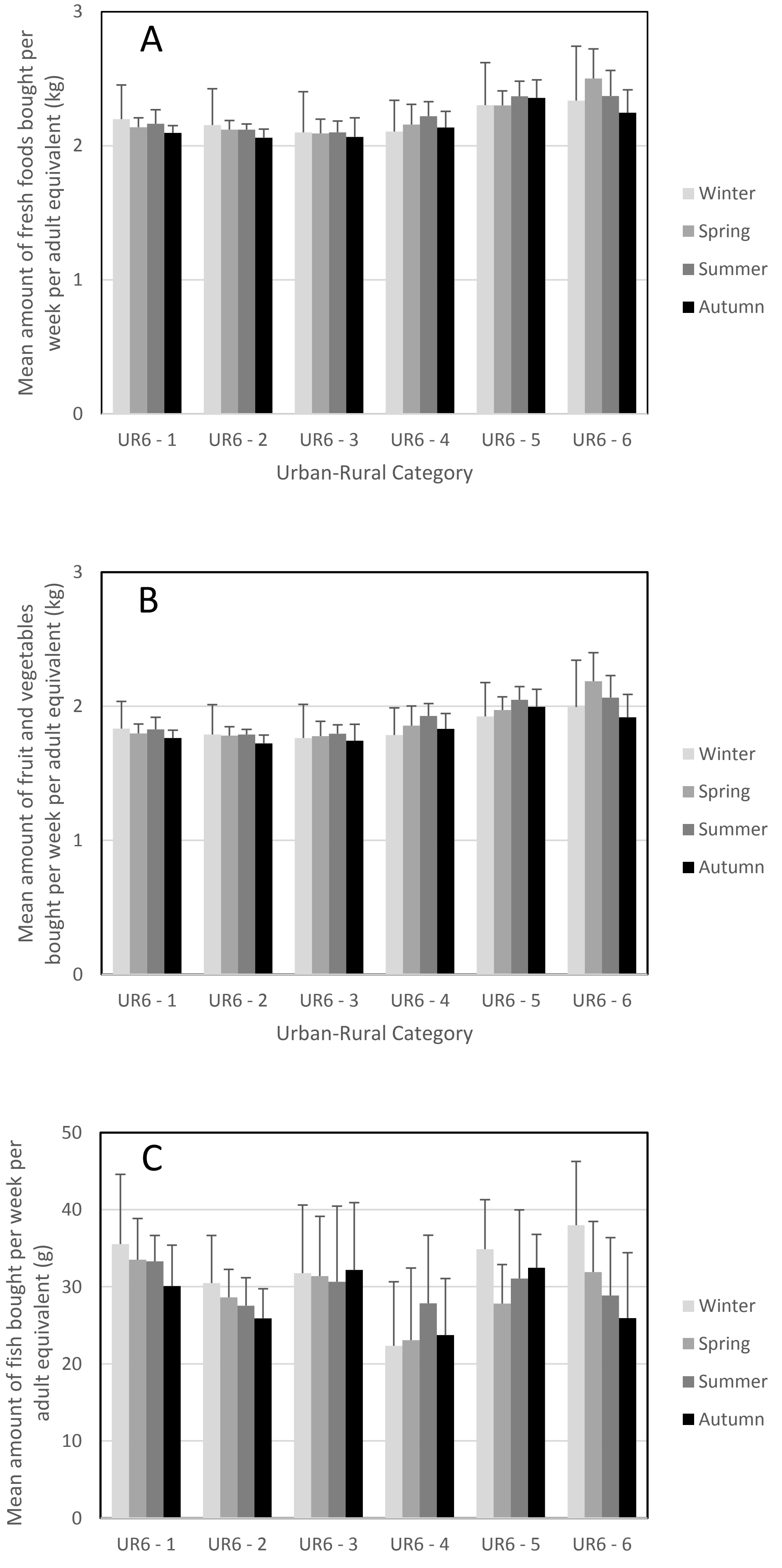

A
Mean expenditure per week per adult equivalent on fresh foods (£)
6
5
4
3
2
1
0
Winter
Spring
Summer
Autumn
UR6 - 1
UR6 - 2
UR6 - 3
UR6 - 4
UR6 - 5
UR6 - 6
Urban-Rural Category
B
Mean expenditure per week per adult equivalent on fruit and vegetables (£)
6
5
4
3
2
1
0
Winter
Spring
Summer
Autumn
UR6 - 1
UR6 - 2
UR6 - 3
UR6 - 4
UR6 - 5
UR6 - 6
Urban-Rural Category
C
Mean expenditure per week per adult equivalent on fish (£)
0.5
0.4
0.3
0.2
0.1
0.0
Winter
Spring
Summer
Autumn
UR6 - 1
UR6 - 2
UR6 - 3
UR6 - 4
UR6 - 5
UR6 - 6
Urban-Rural Category

Figure 2


A
Mean amount of fresh foods bought per week per adult equivalent (kg)
B
Mean amount of fruit and vegetables bought per week per adult equivalent (kg)
C
Mean amount of fish bought per week per adult equivalent (g)
Winter
Spring
Summer
Autumn
UR6 - 1
UR6 - 2
UR6 - 3
UR6 - 4
UR6 - 5
UR6 - 6
Urban-Rural Category