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Differences in expenditure and amounts of fresh foods,
fruits & vegetables and fish purchased in urban and rural
Scotland

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Manuscripts

1 **Differences in expenditure and amounts of fresh foods, fruits &**
2 **vegetables and fish purchased in urban and rural Scotland**

3
4

5 **Abstract**

6 Objective: A quantitative analysis of expenditure on all fresh foods, fruit & vegetables (F&V)
7 and fish, across urban and rural households in Scotland. Fresh foods were chosen since, in
8 general, they are perceived to contribute more to health than processed foods.

9 Design: Descriptive analysis of purchase data of all foods brought into the home during 2012
10 from the Kantar Worldpanel database. Purchase data were restricted to fresh, unprocessed
11 and raw foods, or 'fresh to frozen' foods where freezing was part of harvesting. Total
12 household purchases were adjusted for household size and composition.

13 Setting. Scotland.

14 Subjects. 2576 households.

15 Results. Rural households reported the highest expenditure per person on fresh foods and
16 F&V, but also bought the most (kg) of these items. There was a linear trend of average
17 prices paid with urban/rural location ($p<0.001$), with average prices paid by large urban and
18 remote rural households for fresh food (£2.14/kg and £2.04/kg), F&V (£1.64/kg and
19 £1.60/kg) and fish purchases (£10.07/kg and £10.20/kg), although differences were
20 quantitatively small.

21 Conclusion. Contrary to previous studies, purchase data show that access to, and average
22 prices of fresh foods generally, and F&V and fish specifically, are broadly similar between
23 urban and rural areas. Therefore, the higher expenditure on these foods in rural versus
24 urban areas is probably due to factors other than pricing and availability.

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26

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

28 **Introduction**

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

39

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

52

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

64 risk of CVD⁽¹⁴⁾.

65

66 In this study, therefore, we have examined whether there are differences in expenditure on
67 fresh food products generally, or on fruits and vegetables and fish specifically, between
68 urban and rural areas of Scotland. Note that, in defining fresh foods, some 'fresh to frozen'
69 foods were also included where freezing was considered an essential part of harvesting and
70 where the nutritional quality of these foods is considered similar to the unfrozen equivalent.

71 Furthermore, we investigated whether purchasing behaviour differed according to outlet type
72 or differences in household income or other socioeconomic factors across regions.

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73 **Methods**

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

86

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

101 Household composition within KWP varies by the number of people and their ages, therefore
102 the amount of food needed to be bought each week will also vary. To account for this,
103 expenditure, amount and number of packs of fresh produce were scaled by the estimated
104 energy requirements of the household members to give equivalized values. These were
105 estimated from the sex and age of each individual, and linked to the Dietary Reference
106 Values for Energy ⁽¹⁵⁾. The total estimated energy requirement for each household was
107 calculated from the sum of the individual values per household, and divided by 10.45MJ
108 (2500kcal) to give an adult equivalent value.

109
110 Household location was assessed using the Scottish Government's Urban Rural 6-Fold
111 Classification (UR6 1-6) (Table 1). 95% of Scottish geographical areas are defined as rural,
112 housing almost 19% (13.1% accessible rural, 5.6% remote rural) of the population. Based on
113 this, Scotland is classified as a mostly rural country. **Household income was coded into**
114 **categories, with £0-£9,999 (as Band 1), £10,000-£19,999 (Band 2), £20,000-£29,999 (Band**
115 **3), £30,000-£39,999 (Band 4), £40,000-£49,999 (Band 5), £50,000-£59,999 (Band 6),**
116 **£60,000-£69,999 (Band 7), and £70,000+pa (Band 8).** The SIMD combines 27 indicators
117 across 7 domains (income, employment, health, education, skills and training, housing,
118 geographic access and crime). The overall index is a weighted sum of the seven domain
119 scores. The domain weightings used in SIMD 2012, expressed as a % of the overall weight
120 are: current income (28%), employment (28%), health (14%), education (14%), geographic
121 access (9%), crime (5%) and housing (2%). It collects data from 6,505 small areas (data
122 zones) that cover Scotland and classifies them as most deprived (ranked 1) to least deprived
123 (ranked 6505). In this study, households were grouped based on their home postcode into
124 deciles of deprivation with those least deprived ranked 10. Life stage included households
125 with no children (1), family with children aged 0-4 years (2), family with children aged 5-9
126 years (3), family with children aged 10+ years (4), family with older dependents (5),
127 households where all children had recently left (6) and retired people (7).

128
129 Statistical analyses were conducted using SPSS Version 23 (SPSS/IBM Corp, Armonk, New
130 York, NY). ANOVA was used to test for differences in demographic characteristics,
131 expenditure and amounts of foods purchased by urban/rural area classification. Kruskal-
132 Wallis tests were used to compare the distribution of life stage, and income band, across
133 UR6 groupings. Simple linear regression was used to test for associations between
134 expenditure, amounts of foods, and number of packs purchased as outcome variables, with
135 urban/rural classification as the predictor variable. Microsoft Excel (2010) pivot tables were
136 used for descriptive data analysis. In the calculations, the total number of individuals in a
137 household was defined as the number of adults (age 18 or above) plus the number of
138 children (age 17 or below). Seasons were classified as winter (26th December 2011 – 25th
139 March 2012), spring (26th March 2012 – 24th June 2012), summer (25th June 2012 – 23rd
140 September 2012) and autumn (24th September 2012 – 23rd December 2012). Shopping
141 venues were classified into major supermarket brands (ASDA, Co-op, Morrisons, Marks and
142 Spencer, Sainsbury's, Tesco and Waitrose), internet major supermarket brands, discount
143 supermarkets (Aldi, Costco, Lidl and Iceland), corner shops and other local shops (Best
144 One, Budgens, Costcutter, FarmFoods, Londis, Mace, Nisa Today, newsagents, off-licence
145 shops, butcher, bakery, fish monger, One stop, Premier Stores, Tesco metro, Sainsbury's
5

146 local, Market stalls and Spar) and other shops (all stores that sell non-food as a main
147 product).

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148 **Results**

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

161

162 Across the urban-rural categories from UR6 1 through to UR6 6, there was a **significant**
163 **linear** increase in both weekly expenditure (in £) and in amounts (in kg) of total fresh foods
164 and fruit & vegetables bought **per adult equivalent** (Table 3). Consequently, rural households
165 (UR6 5 or UR6 6) recorded the highest expenditure, and bought the most amounts, of these
166 products. Overall, expenditure on vegetables was approximately 20% higher than that spent
167 on fruits. Household expenditure on, and amount bought of fish was more variable and did
168 not differ greatly between UR6 categories. This variability probably originates from the fact
169 that not all households purchased fish products – only 68%, 66%, 68%, 65%, 73% and 74%
170 of households reported any fish purchases throughout the year in UR6 1 to UR6 6,
171 respectively. Across UR6 categories, expenditure was highest on oily fish, but in general,
172 greater amounts of white fish were purchased, especially in rural households (Table 3).
173 **Mean per adult equivalent weekly expenditure on fresh foods, fruits and vegetables, and fish**
174 **differed across the seasons** ($p=0.003$, $p<0.001$ and $p=0.011$ respectively), but there was no
175 **significant interaction between season and UR6** (Figure 1). A similar pattern was also seen
176 for the amounts of fresh foods, fruits and vegetables, and fish bought ($p=0.136$, $p=0.005$ and
177 $p=0.009$ respectively, Figure 2). For the amount of fish bought there was a **significant**
178 **interaction between season and UR6** ($p=0.036$).

179 Expenditure per kg and per item were both significantly different ($p < 0.001$) across UR6
180 categories, and there were significant linear trends for decreasing expenditure per kg and
181 increasing expenditure per item from large urban to remote rural areas ($p < 0.001$). The
182 differences were, however, quantitatively small (Table 4).

183

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

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190 **Discussion**

191

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

203

204 Although we found that expenditure on all fresh foods, and on fruits & vegetables, in rural
205 areas (UR6 5 and UR6 6) was higher compared with urban areas (UR6 1-4), **this appeared**
206 **to be a result of** purchasing more of these food items, rather than paying more per item.
207 Average prices per pack or average prices per kg across fresh food, fruits & vegetables and
208 fish purchases were quantitatively similar, although **differences were** statistically significant,
209 across all UR6 categories with decreasing cost per kg in more rural areas (Table 4). This
210 disagrees with findings in some previous studies. Indeed, Dawson et al ⁽²⁾ found that the cost
211 of a basket of healthy products including fruit and vegetables and fish was highest in rural
212 versus urban locations, **with costs of £46.68 and £43.60 in affluent rural and affluent urban,**
213 **and £52.75 and £43.87 in deprived rural and deprived urban areas respectively (late**
214 **2005/early 2006 prices)**. The discrepancy may be explained by different foods being bought
215 by urban and rural households in the current study, which did not include a direct like-for-like
216 price comparison. Additionally, Hirsh et al ⁽¹⁾ recently reported that food prices were about
217 10% higher in supermarkets in remote rural Scotland and considerably more than this in
218 local stores, although this was in comparison to prices for a rural English town. This **latter**
219 study also reported that remote rural households mixed supermarket shopping with local top-
220 ups, spending 10-20% more on a food basket compared with urban British households,
221 whilst in the most remote island communities, reliance only on local stores could add over
222 50% to the total food budget ⁽¹⁾. The difference between the current study and some of the
223 older studies may be explained by the fact that most rural households now have easier
224 access to large supermarkets, either directly or through internet shopping **as supported by**
225 **the current findings that similar levels of relative spend on fresh food items were reported in**
226 **rural and urban locations**. The growth of online retailing has had a profound effect on island

227 residents in improving access to goods ⁽¹⁸⁾, and presumably also had a similar effect on
228 remote rural mainland households. Indeed, 99% of both rural and urban households **in this**
229 **study** reported at least some expenditure in **major** supermarket outlets, and the percentage
230 of shopping carried out through the internet was 2-3 times higher in rural versus urban areas
231 (Table 5). We did find, however, that rural households reported a higher amount of
232 purchases from local shops compared with urban households, but this did not result in major
233 differences in **the** average price per kg of fresh food bought across UR6 categories. Both the
234 retail market and food marketing has changed significantly over the last 10 years, with an
235 increasing number of larger supermarkets opening in various locations including out-of-town,
236 making them readily available to the population, a phenomena also reported by Clarke and
237 Banga ⁽¹⁹⁾. This generally leads to greater price competition with lower prices, wider choices,
238 and better quality across retail outlets ^(6,9). **Therefore, the current findings provide evidence**
239 **that differences in spatial access to healthy food, at least those concerning fresh food**
240 **purchases, may have become less prevalent throughout Scotland.**

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

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

263

10

264 There was a higher proportion of households with lower income bands in rural than more
265 urban areas, yet expenditure on fresh foods, and fruit and vegetables was higher per person
266 in rural areas. This is in contrast to the observation of Pateman⁽²⁵⁾ that high income
267 households residing in rural Britain spent the most on fresh healthy foods, and other studies
268 reporting a positive correlation between higher socioeconomic background and highest
269 expenditure on fresh foods⁽²⁶⁾. However, comparisons between studies should be based on
270 the use of equivalized income values (i.e. household incomes that are adjusted for
271 household size and composition) rather than income bands as used by KWP. Indeed, a
272 higher household income band recorded by KWP does not necessarily mean more money
273 being available per person for buying food. Multiple studies have investigated how
274 deprivation shapes accessibility, availability and affordability of fruit and vegetables^(27,28,29,30).
275 Cummins and colleagues⁽³¹⁾ pioneered research into deprivation and food accessibility in
276 Scotland and since then a growing body of literature has supported the correlation between
277 deprivation and food accessibility^(32,33), although some other studies have found the
278 opposite trend, i.e. greater healthy food availability in more deprived areas^(34,28). The most
279 recent estimation of food intake from food purchase data in Scotland (2010-2012)⁽³⁵⁾ shows
280 a clear gradient in fruit and vegetable consumption by SIMD quintile - in the most deprived
281 quintile, mean daily consumption was 205g/day compared with 311g/day in the least
282 deprived quintile across 2010 to 2012. Consumption of oil rich fish was also highest in the
283 least deprived quintile with mean weekly consumption of 39.2g/week compared to
284 19.0g/week in the most deprived. However, this difference was due to fewer consumers of
285 oil rich fish in the most deprived quintile, rather than lower intakes by consumers⁽³⁵⁾. Our
286 data indicate that the majority of consumers have access to fresh foods generally, and to
287 fruits and vegetables and fish specifically. Therefore, lower purchasing levels may be
288 determined more by food choice, (including differences in the amount of food eaten outside
289 the home), and affordability as lower income households spend a greater proportion of their
290 income on food than do more affluent households, than by availability and differences in
291 price faced by consumers.

292

293 **Limitations**

294 The present study is subject to a number of limitations. The KWP panel may differ to some
295 extent from the general population as they report lower household incomes, are more likely
296 to be middle aged and have a greater proportion of multiple-adult households compared to
297 households participating in the Living Costs and Food Survey⁽³⁶⁾. Also, there is evidence
298 that not all food purchases that are brought into the home are recorded by panel members,
299 with fruit and fish of the food groups appearing to be particularly affected, when compared to

300 reporting in the Living Costs and Food Survey⁽³⁶⁾. Therefore, the amounts of produce
301 reported are likely to be underestimates across the UR6 categories.

302

303 **Conclusions**

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

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312

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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 |

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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 (0.31;0.35) | 0.28 (0.27;0.30) | 0.31 (0.29;0.33) | 0.23 (0.21;0.26) | 0.30 (0.28;0.32) | 0.31 (0.29;0.34) | <0.001 | 0.230 |
| Amount (g) | 33.1 (31.4;34.8) | 28.1 (26.9;29.4) | 31.5 (29.1;33.9) | 24.3 (21.9;26.6) | 31.6 (29.7;33.4) | 31.2 (28.7;33.6) | <0.001 | 0.470 |
| # of packs | 0.12 (0.11;0.12) | 0.09 (0.09;0.10) | 0.10 (0.09;0.11) | 0.09 (0.08;0.09) | 0.10 (0.09;0.10) | 0.10 (0.09;0.11) | <0.001 | 0.020 |
| 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 \pm 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 \pm 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 |
| <i>Greengrocer/Fruiterer</i> | 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 |

| | | | | | | | |
|--------------------|------|------|------|------|------|-------|--------------|
| <i>Fish monger</i> | 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.'*

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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.



