Food expenditure and nutritional quality over the Great Recession

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Executive summary

- Real wages have declined and unemployment has increased since the beginning of the recession in 2008, squeezing households' budgets. There has also been a substantial increase in the price of food relative to other goods.

- How households' food purchasing behaviour responded is of interest both because food is a large share of households' total spending (around 17.5% on average) and because changes in food purchasing behaviour can have important implications for diet. We are able to study this exploiting very detailed data on a set of households' food purchases through time.

- British households have cut real expenditure on food brought into the home. (Real expenditure on food is nominal expenditure on food divided by the food component of the consumer price index.)

- They have reduced the amount of calories they buy and substituted to cheaper food. The reduction in calories was less than the reduction in real expenditure.

- Comparing the years before the recession (2005–07) with 2008–09, households on average:
  - reduced real expenditure on food purchases brought into the home by 3.9%;
  - reduced calories purchased by 1.8%;
  - spent 2.1% less per calorie.

- Comparing the years before the recession (2005–07) with 2010–12, households on average:
  - reduced real expenditure on food purchases brought into the home by 8.5%;
  - reduced calories purchased by 3.6%;
  - spent 5.2% less per calorie.

- Households with young children reduced real expenditure, calories and real expenditure per calorie more, on average, than other household types.

- These changes coincided with an increase in the calorie density of foods, as households switched to foods with more calories per kilogram.

- The nutritional quality of the foods that households purchased also changed: a number of measures show a reduction in quality, on average, over this period.

- All of these measures suggest that pensioner households, single-parent households and households with young children saw the largest declines in the nutritional quality of the foods purchased between 2005–07 and 2010–12.

- This decline in the average nutritional quality of foods purchased was primarily driven by a substitution towards processed sweet and savoury food and away from fruit and vegetables. Households' substitution within each of 11 broad food groups, when taken individually, acted to improve nutritional quality on average.

- On average, all household types moved away from calories from fruit and vegetables, with the largest switches away being by households with young children and single-parent households.

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1. Introduction

The recent economic crisis, now referred to as the Great Recession, has led to a sustained squeeze on households' budgets. Concurrently, food prices rose sharply and by more, on average, than other goods. In this briefing note, we document how the food purchases of households in the UK have changed over this period of recession and food price rises. We follow the same households over time, which allows us to control for fixed differences in households' food purchasing behaviour. We show that, on average, real food expenditure (i.e. nominal expenditure on food divided by the food component of the consumer price index) declined and that households bought fewer calories and have switched to cheaper calories. This has coincided with a switch towards more calorie-dense *types* of food and substitution to more calorific food products within food types.

We also investigate how the nutritional quality of the foods that households purchase has changed over this period. We find that, on average, across a number of measures, the nutritional quality of foods purchased declined from 2005–07 to 2010–12. Households substituted towards less healthy food types, mainly towards processed foods and away from fruit and vegetables. However, they also shifted towards healthier food products *within* food types (for example, the average saturated fat content of processed food declined).

There are differences across households. Households with young children cut back on calories purchased by more than other household types. Pensioners reduced calories purchased by more than non-pensioner households without children. All household types reduced their real expenditure per calorie, with the average reduction being largest for households with young children.

Changes in the average nutritional quality of foods purchased also varied by household type. Pensioners, households with young children and single-parent households experienced a larger decline in the nutritional quality of the foods they purchased. This was partly due to greater substitution towards processed food and away from fruit and vegetables, which contributed towards increases in the intensity of saturated fat and sugar in their purchases.

The briefing note is structured as follows. Section 2 provides some background. Section 3 describes how the food purchasing behaviour of

households has changed over the recession. Section 4 describes how the nutritional quality of the foods that households purchase has changed since 2005. Section 5 summarises and concludes.

2. Background

The UK economy has been stagnant since the start of the global economic crisis in 2008. Prices have increased faster than wages and unemployment has increased, squeezing households' disposable incomes. From 2007 to 2011, the median real net income for parents with dependent children fell by 7.5%, that for pensioner households rose by 3.7% and that for non-pensioners without dependent children fell by 0.8%.[2]

Recent work by Crossley, Low and O'Dea (2013)[3] documents the fact that, over the recent recession, households have cut back on spending by more than in previous recessions and, in contrast to earlier recessions, they have cut back on food spending.

Around the same time as the global recession, the price of food in the UK rose sharply. From 2007 to 2012, the price of food rose by 10.2% more than the price of all goods (measured by the consumer price index). This increase coincided with a worldwide increase in food prices, driven by a sharp rise in the price of certain commodities.[4] However, UK food prices rose by more than in comparative economies (see Figure 1). Not only was the increase higher in the UK, but this larger increase in the price of food relative to other goods has persisted for longer than in other OECD countries.

The combined impact of the squeeze on household budgets and higher food prices translated into changes in the share of households' total expenditure allocated to food. From 2005 to 2009, average household

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[2] Authors' calculations using the Family Resources Survey. Households' net real income is after housing costs and is deflated by the consumer price index.

[3] T. F. Crossley, H. Low and C. O'Dea, 'Household consumption through recent recessions', *Fiscal Studies*, 2011, 34, 203–29 (http://onlinelibrary.wiley.com/doi/10.1111/j.1475-5890.2013.12003.x/pdf).

[4] HM Government, *The 2007/08 Agricultural Price Spikes: Causes and Policy Implications*, 2010 (http://archive.defra.gov.uk/foodfarm/food/pdf/ag-price100105.pdf).

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expenditure on food and alcohol as a share of total expenditure rose from 17.4% to 18.2%, but it fell back to 17.6% in 2011.[5]

Figure 1. Real food price in selected countries since 2005

Note: Price of food in (i.e. excluding food bought in restaurants and takeaways) from the consumer price index (CPI) relative to overall level of CPI for that country. January 2005 = 1. Source: OECD, calculated using Consumer Prices and Consumer Prices – food, monthly.

In this briefing note, we describe changes in food purchased for consumption at home; this does not include food purchased and eaten outside of the home. Food at home accounts for 86.1% of total calories purchased in 2005–07; this figure rose to 87.3% in 2010–11.[6]

We document changes in households' real food expenditure, in the number of calories they purchase and in the nutritional quality of foods purchased over the period 2005–12. We use extremely detailed data on food purchases that households made and brought into the home.[7] These rich

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[5] Authors' calculations using the Living Costs and Food Survey, 2005–11. Prior to 2008, this survey was called the Expenditure and Food Survey (and, before that, the Family Expenditure Survey).

[6] Authors' calculations using the Living Costs and Food Survey, 2005–11.

[7] The data are from the Kantar Worldpanel; see the appendix for details.

data allow us to follow the same households through time and thus control for fixed differences in households' behaviour.

3. Household food spending

We begin by describing how household food spending patterns have changed over the recession. The recession is estimated to have started in the second quarter of 2008 and to have ended in the third quarter of 2009.[8] We compare three periods – before the recession (2005Q1–2007Q4), a period covering the recession (2008Q1–2009Q4) and since the recession ended (2010Q1–2012Q2).

We measure real food expenditure as nominal food expenditure (on food purchases brought into the home) divided by the food component of the consumer price index[9] and we adjust real food expenditure so that it is expressed in adult-equivalent terms (see the appendix for details). Figure 2 shows how average real food expenditure for home consumption per adult-equivalent has changed over the period 2005–12. Over 2005–07, the average household spent £102 each month per adult-equivalent (in January 2008 pounds); this had fallen by £4.00 (3.9%) on average by 2008–09 and was £8.70 (8.5%) lower than in 2005-07 by 2010–12. Spending continued to fall substantially after the end of the recession in 2009. Over this period, nominal spending on food rose, but by less than the increase in the price of food.

In Figure 3, we show how the number of calories (from food purchases brought into the home) has changed over time. Over the period 2005–07, households purchased, on average, 2086 calories[10] per adult-equivalent per day; in 2008–09, households purchased 38 (1.8%) fewer calories on average; and by 2010–12, they purchased 74 (3.6%) fewer calories than in 2005–07.

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[8] We use the convention of defining a recession as two or more consecutive periods of decline in GDP.

[9] This can be interpreted as a quantity index of food purchased – i.e. if the price of food rises by more than a household's nominal expenditure, the household is not able to purchase as much food, and this will be reflected in lower real food expenditure.

[10] Throughout, we use the convention of abbreviating kilocalorie to calorie.

Figure 2. Real food expenditure per adult-equivalent per month
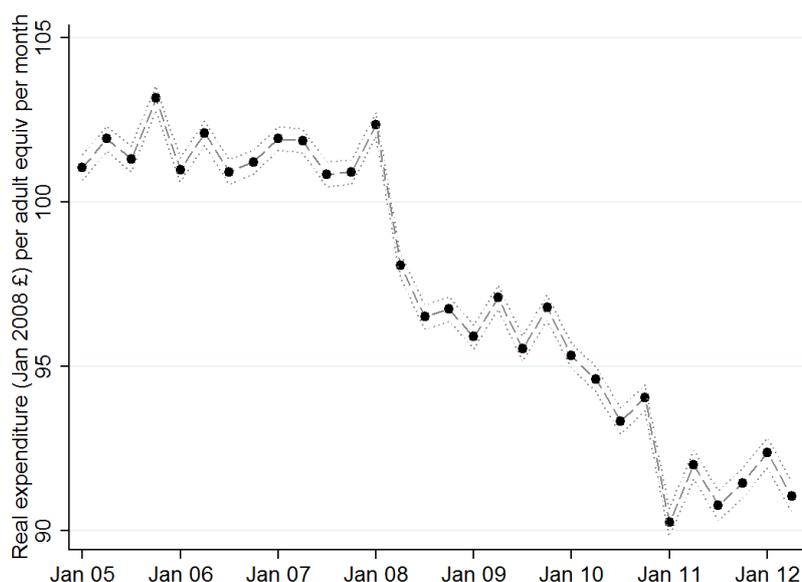
Note: Each dot represents mean real food expenditure (nominal food expenditure divided by the food component of the consumer price index for food, indexed to January 2008) per adult-equivalent (see the appendix for details of adjustment) per month after removing month effects and permanent differences in real expenditure across households. The grey dotted lines are 95% confidence intervals.

Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

Figure 3. Calories purchased per adult-equivalent per day
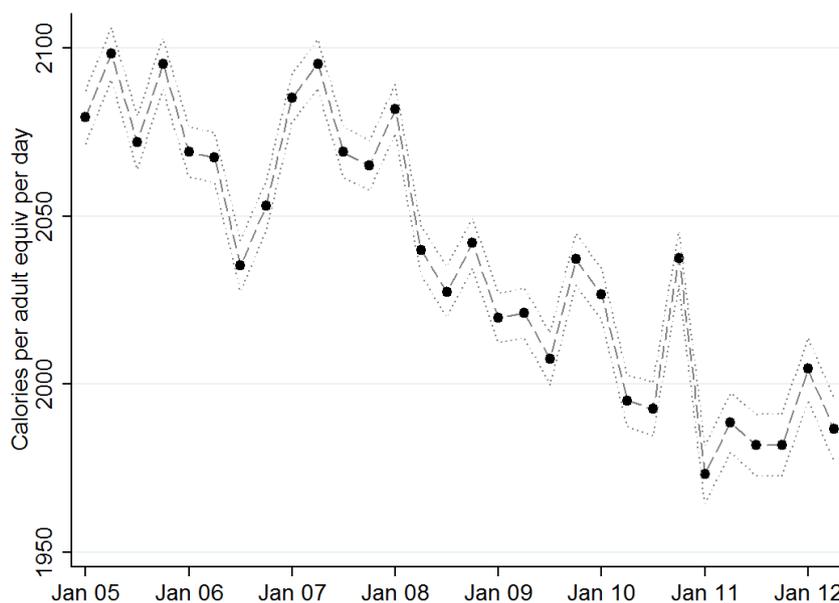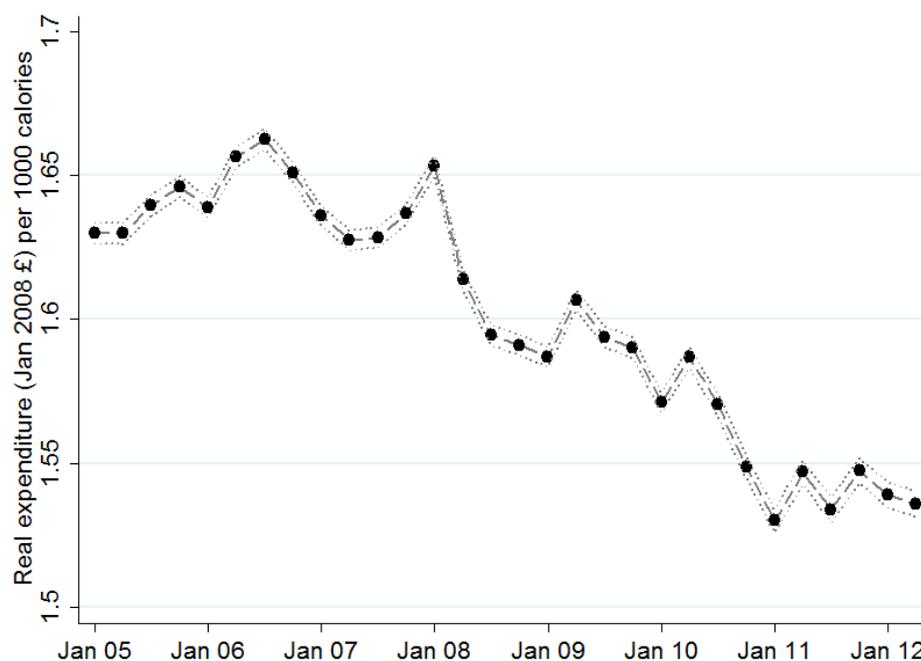

Note: Each dot represents mean calories purchased per adult-equivalent (see the appendix for details) per day after removing month effects and permanent differences in calories purchased across households. The grey dotted lines are 95% confidence intervals.

Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

Figure 3 shows that calories declined between 2005 and 2012, with the sharpest fall being between 2008 and 2012. Recent work by Griffith, Lluberas and Lührmann (2013)[11] shows that calories purchased have gradually declined since 1980. What is unusual about recent changes in food purchases is both the extent to which households have reduced their real expenditure and the fact that they have done so by more than they have reduced calories purchased, meaning real food expenditure per calorie has fallen. This latter fact bucks a long-run trend toward higher real expenditure per calorie since 1980.

Figure 4 shows that, on average, households reduced real expenditure per 1000 calories from around £1.64 in 2005–07 – by 2.1% to 2008–09 and by 5.2% from 2005–07 to 2010–12. This means that households substituted to foods that provided cheaper calories.

Figure 4. Real expenditure per 1000 calories

Note: Each dot represents mean real expenditure (in January 2008 prices) per 1000 calories after removing month effects and permanent differences in real expenditure per 1000 calories across households. The grey dotted lines are 95% confidence intervals.
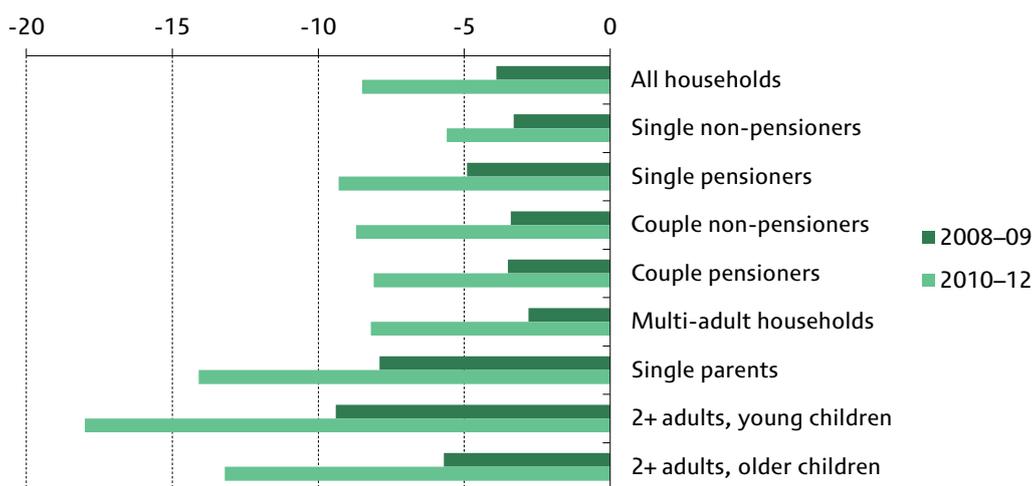Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

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[11] R. Griffith, R. Lluberas and M. Lührmann, 'Gluttony in the UK? Long-term change in diet', IFS Briefing Note BN142, 2013 (http://www.ifs.org.uk/bns/bn142.pdf).

Households were affected differently by the recession (both directly and by the government's fiscal policy response to the recession) and differed in the way they adjusted their food purchases in response to this and to the rise in food prices. We compare the changes in spending patterns across eight household types. We split households according to the number of people living in the household, whether there were children present and the ages of the adults and children (see the appendix for details).

Figure 5 shows the average percentage change in real food expenditure from 2005–07 to 2008–09 and 2010–12 for eight household types. It shows that all household types reduced their real food expenditure, on average, and that all household types continued to reduce their real food expenditure following the end of the recession. The largest declines are for households with children.

Figure 5. Percentage change in real food expenditure from 2005–07 to 2008–09 and 2010–12

Note: The numbers are available in Table A3 in the appendix. The bars express percentage changes in real food expenditure per adult-equivalent from 2005–07 to 2008–09 and 2010–12, controlling for month effects and permanent differences in real expenditure across households. All changes are statistically different from zero at the 99% level. See the appendix for more details of the method.
Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

Figure 6 shows the percentage change in calories purchased from 2005–07 to 2008–09 and 2010–12. Calorie purchases for single non-pensioner households stayed approximately the same over 2005–12. Households with children experienced the biggest declines. Pensioner households have

also seen relatively large declines in calories purchased, with single pensioners reducing calories purchased by more than pensioner couples.

Figure 6. Percentage change in calories purchased from 2005–07 to 2008–09 and 2010–12
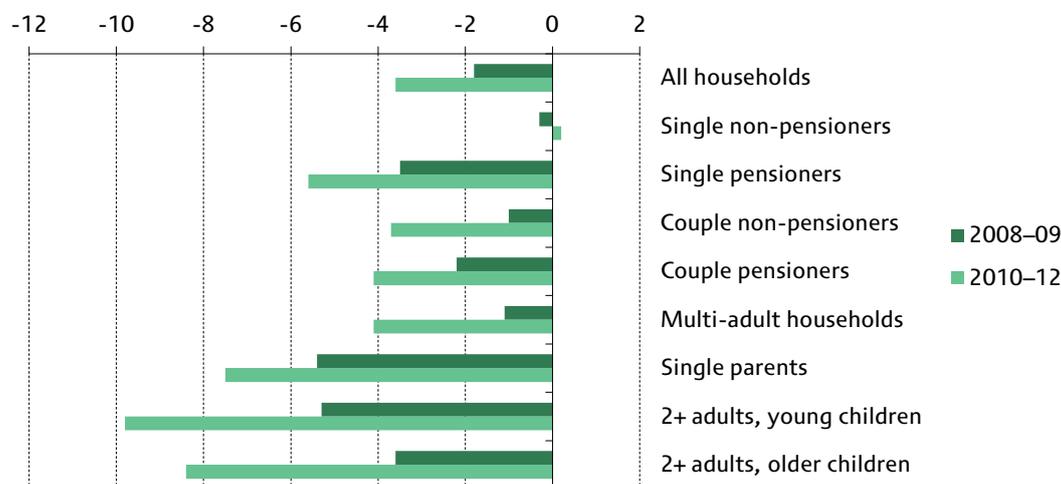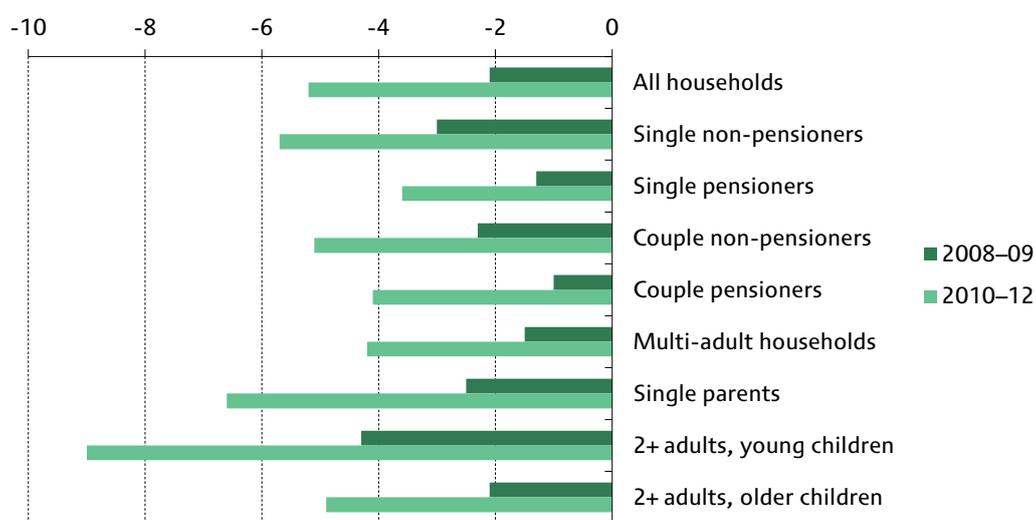

Note: The numbers are available in Table A3 in the appendix. The bars express percentage changes in calories per adult equivalent purchased from 2005–07 to 2008–09 and 2010–12, controlling for month effects and permanent differences in calories across households. All differences are statistically different from zero at the 99% level apart from 'Single non-pensioners' (2008–09 and 2010–12). See the appendix for more details of the method. Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

Figure 7 shows the percentage change in real expenditure per calorie purchased from 2005–07 to 2008–09 and 2010–12. All household types substituted towards cheaper calories during the recession and continued to do so in the period after the recession. Households with young children reduced their real expenditure per calorie by the largest amount; the decline for this group in real expenditure per calorie was 9.0%. This is despite the fact that households with children (of all ages) had the lowest expenditure per calorie in the pre-recessionary period.

One way that households may have been able to reduce real expenditure per calorie is by switching to more calorie-dense foods (food with more calories per kilogram). This does not necessarily imply a less nutritious diet, but does cast light on how households may have reduced the amount they spent per calorie. To the extent that such foods are cheaper in per-calorie terms, this would enable households to reduce calories purchased by less than expenditure. Households could have increased the calorie density of their food purchases by substituting across broad food groups

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towards groups with more calories per kilogram of produce. However, they could also have switched to more calorie-dense food products within each food group. We explore which of these forms of switching was more important by splitting food into 11 groups – fruit, vegetables, grains, dairy and fats, milk, red meat, poultry and fish, processed savoury food, processed sweet food, soft drinks and alcohol. This classification is based on one devised by the US Department of Agriculture (USDA) and is designed to capture broad differences in nutrients across food groups.[12]

Figure 7. Percentage change in real expenditure per calorie from 2005–07 to 2008–09 and 2010–12

Note: The numbers are available in Table A3 in the appendix. The bars express percentage changes in real expenditure per calorie from 2005–07 to 2008–09 and 2010–12, controlling for month effects and permanent differences in real expenditure per calorie across households. All changes are statistically different from zero at the 99% level. See the appendix for more details of the method.
Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

We are interested in how the calorie density (calories per 100g) of food purchases changed over this period, and whether this was due to people allocating calories differently across the main food groups or whether it was due to them buying different products within each food group. For example, did people substitute away from vegetables to grains or prepared

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[12] J. E. Todd, L. Mancino, E. Leibtag and C. Tripodo, *Methodology behind the Quarterly Food-at-Home Price Database*, United States Department of Agriculture, Technical Bulletin 1969, 2010 (http://www.ers.usda.gov/publications/tb-technical-bulletin/tb1926.aspx#.UmeyBhDF6YI).

food, or did they buy more calorie-dense ready meals or more calorie-dense vegetables? We split the change in calorie density into a 'between' component (the change that was due to people substituting between food types) and a 'within' component (the change that was due to people substituting within food types).[13]

Table 1. Percentage change in calorie density from 'within' versus 'between' substitution

	% change from 2005–07 to 2010–12		
	Actual	**Between**	**Within**
Single non-pensioners	4.4	2.9	1.6
Single pensioners	5.4	4.6	0.1
Couple non-pensioners	3.7	2.5	1.0
Couple pensioners	4.9	4.1	0.7
Multi-adult households	4.3	3.0	1.1
Single parents	5.3	3.3	1.6
2+ adults, young children	6.6	4.6	1.9
2+ adults, older children	3.6	1.5	1.9
All households	4.8	3.4	1.2

Note: The numbers give the percentage change in calorie density (calories per 100g) of food purchased from 2005–07 to 2010–12, controlling for month effects and permanent differences in calorie density across households. Between substitution allows households' quantity share allocated to each food group to vary, but holds what they bought within each group constant. Within substitution allows what households bought within each food group to vary, but holds the quantity share allocated to each group constant. Actual change allows both quantity share and what was bought within each group to vary. The sum of the between and within terms does not necessarily equal the actual term due to an omitted covariance term. See the appendix for more details of the method. All changes are statistically different from zero at the 99% level apart from 'Single pensioner – Within'.
Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

Table 1 shows that the average calorie density of households' purchases increased by 4.8%, on average, between 2005–07 and 2010–12. It also documents the impact of between food type substitution (holding within substitution constant) and the impact of within food type substitution (holding between substitution constant) on the average change in calorie density. It shows that substitution between food groups increased the calorie density of food purchased for all household types. Within food

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[13] To compute the between component, we allow the quantity shares of 11 food groups to vary but hold what households bought within each group constant. To compute the within component, we hold the calorie shares of the food groups fixed but allow what households bought within each group to vary.

group substitution also acted to increase average calorie density, but this effect was smaller than the impact of between food group substitution. In other words, most of the increase in calorie density can be put down to households changing the types of food they were purchasing – e.g. switching from fruit and vegetables to processed food – rather than changing within food types – e.g. switching from less calorie-dense processed food to more calorie-dense processed food.

4. Changes in nutritional quality of foods purchased

The changes in households' food spending patterns coincided with changes in the nutritional composition of their purchases. We use a number of alternative measures of the nutritional quality of foods to describe the likely implications of these changes for the diets of different types of household.

We begin with three measures that aggregate several aspects of nutritional quality into a convenient single measure of nutritional quality. These measures are all based on the quantity of nutrients and of particular food types per unit amount of produce (either per 100g or per 1000 calories). They therefore measure the composition of foods purchased, rather than the overall amount purchased.

The first measure is a nutrient profiling model (NPM) used by the government to assess the healthiness of food products.[14] The measure depends on a product's energy density, saturated fat, sodium, sugar content (all of which contribute negatively), protein, fibre, and fruit and vegetable content (which contribute positively); see the appendix for further details. We construct an average (weighted by quantity) for each household in each month across all the products purchased.

The second composite measure of nutritional quality is also based on the NPM. The government classifies a food product as 'less healthy' if it has an NPM score of 4 points or more, and it classifies a drink product as 'less healthy' if it has an NPM score of 1 point or more. For each household, in

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[14] M. Rayner, P. Scarborough and T. Lobstein, 'The UK Ofcom nutrient profiling model: defining "healthy" and "unhealthy" foods and drinks for TV advertising to children', 2009 (http://www.dph.ox.ac.uk/bhfhprg/publicationsandreports/acad-publications/bhfhprgpublished/nutrientprofilemodel).

each month, we measure the share of its total calories that are bought in the form of produce that is not deemed to be 'less healthy'.

The third composite measure of nutritional quality we use is the Healthy Eating Index (HEI).[15] This is calculated on the basis of how calories are distributed across food types and nutrients. The HEI is the primary measure used by the USDA to measure compliance with the US government's recommendations for a healthy diet, *Dietary Guidelines for Americans*. The HEI assigns scores to various components of foods purchased, which reflect the importance of certain food types and certain nutrients. It is constructed based on the amounts per 1000 calories of produce of 12 components, including both food types (fruit, vegetables, grains, milk, meat and oils) and nutrients (saturated fat, sodium, added sugar, solid fat and alcohol); see the appendix for further details.

We compare the change in the NPM score, the percentage of calories not deemed 'less healthy' and the HEI scores from 2005–07 to 2008–09 and 2010–12 by household type. Positive numbers indicate that the quality score improved and negative numbers indicate the score declined.

According to each measure, the average quality of foods purchased by each household type declined from 2005–07 to 2008–09 and 2010–12, with the exception of households with older children measured using the percentage of calories not deemed to be 'less healthy' and of multi-adult households using the same measure for the change from 2005–07 to 2010–12 (see Table 2). Each measure of nutritional quality indicates that, by 2010–12, pensioner households, single-parent households and households with young children had experienced a larger decline in the nutritional quality of foods purchased, on average, than other household types.

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[15] P. M. Guenther, J. Reedy, S. M. Krebs-Smith, B. B. Reeve, P. P. Basiotis, *Development and Evaluation of the Healthy Eating Index-2005: Technical Report*, Center for Nutrition Policy and Promotion, US Department of Agriculture (http://www.cnpp.usda.gov/Publications/HEI/HEI-2005/HEI-2005TechnicalReport.pdf).

Table 2. Change in composite measures of nutritional quality, by household type

	NPM score		Change in: % of calories not deemed 'less healthy' From 2005–07 to:		HEI score	
	2008–09	2010–12	2008–09	2010–12	2008–09	2010–12
Single non-pensioners	–0.16	–0.20	–0.75	–0.40	–1.25	–1.57
Single pensioners	–0.26	–0.31	–1.45	–1.37	–1.97	–2.74
Couple non-pensioners	–0.12	–0.13	–0.44	–0.14	–1.02	–1.13
Couple pensioner	–0.15	–0.24	–0.73	–0.85	–1.39	–2.40
Multi-adult households	–0.05	–0.07	–0.01	0.35	–0.40	–0.88
Single parents	–0.12	–0.24	–0.67	–1.55	–1.21	–2.48
2+ adults, young children	–0.14	–0.26	–0.67	–1.35	–0.56	–1.28
2+ adults, older children	–0.01	–0.05	0.65	0.88	–0.40	–1.19
All households	–0.13	–0.18	–0.47	–1.00	–1.00	–1.64

Note: The numbers give the change in each variable from 2005–07 to 2008–09 or 2010–12, controlling for month effects and permanent differences in the variable across households. All the changes are statistically different from zero at the 99% level, apart from '2+ adults, older children – NPM score (2008–09)', 'Couple non-pensioners – % of calories (2010–12)', 'Multi-adult households – % of calories (2008–09)'. The NPM score ranges from –6.1 to 21.6, with a mean of 1.45 across all households and months. The percentage of calories not deemed 'less healthy' ranges from 0% to 100%, with a mean of 47.2% across all households and months. The HEI ranges from 2.9 to 100, with a mean of 50.5 across all households and months.
Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

The numbers for the changes in the share of calories not deemed 'less healthy' are straightforward to interpret. For instance, by 2010–12, single pensioner households were purchasing an additional 1.4 percentage points of their calories from products deemed to be 'less healthy' (an increase from 51.2% to 52.6% of calories). Interpreting the size of the changes in the other two measures of nutritional quality is slightly trickier, because they are aggregates of scores for a number of aspects of nutrition. One way to interpret them is to consider one component of nutrition and ask by how much it would have to change to generate the fall that we observe. For instance, single pensioners' NPM score fell, on average, by 0.31 by 2010–12. This group of households, on average, buy 18.3% of their calories from the prepared savoury food groups. If they switched within this group to buying produce that had 1.6g of saturated fat per 100g more

(from an average of 2.7g per 100g), this would be enough to generate the 0.31 observed decline. Similarly, a decline of 2.74 in the HEI score (the decline observed for single pensioners by 2010–12) corresponds to a decline of 1.6 portions of fruit per 2000 calories (from an average of around 4 portions for this group).

Table 3. Change in measures of nutrient intensity, by household type

	Change in:							
	Saturated fat (g per 100g)		Sugar (g per 100g)		Protein (g per 100g)		% of calories from fruit and vegetables	
	From 2005–07 to:							
	2008–09	2010–12	2008–09	2010–12	2008–09	2010–12	2008–09	2010–12
Single non-pensioners	0.08	0.09	0.17	0.20	0.09	0.12	–1.05	–1.08
Single pensioners	0.11	0.12	0.33	0.35	0.08	0.08	–1.16	–1.11
Couple non-pensioners	0.05	0.07	0.16	0.29	0.04	0.05	–0.93	–0.90
Couple pensioners	0.08	0.12	0.21	0.30	0.09	0.09	–0.82	–1.10
Multi-adult households	0.04	0.07	0.16	0.18	0.05	0.11	–0.51	–0.64
Single parents	0.04	0.08	0.13	0.26	0.12	0.21	–0.82	–1.22
2+ adults, young children	0.03	0.05	0.29	0.44	0.10	0.15	–0.85	–1.20
2+ adults, older children	0.02	0.03	0.01	0.00	0.14	0.20	–0.43	–0.71
All households	0.06	0.08	0.20	0.27	0.08	0.11	–0.80	–0.94

Note: The numbers give the change in each variable from 2005–07 to 2008–09 or 2010–12, controlling for month effects and permanent differences in the variable across households. All the changes are statistically different from zero at the 99% level, apart from '2+ adults, older children – Sugar (2008–09 and 2010–12)'.
Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

We also look at how several individual aspects of nutritional quality have changed over the same periods. Table 3 shows changes in saturated fat, sugar, protein (all in grams per 100g) and fruit and vegetable calories (as a share of total calories) that households purchased. Pensioner households substituted more towards saturated fat than all other household types, and they also substituted more towards sugar than average. The increase of 0.12g per 100g of saturated fat equates to an increase of approximately 2g per adult-equivalent per day (relative to the government's recommendation that men should consume no more than 30g, and women

no more than 20g, of saturated fat per day). Households with young children substituted toward sugar to a greater degree than all other household types. The 0.44g per 100g increase for households with young children is approximately a 6g per adult-equivalent per day increase (relative to the government's guideline daily amount for sugar of 90g). All households increased the amount of protein they purchased, but pensioners did this by less than average. On average, all household types switched away from calories from fruit and vegetables, with the largest switch away being by households with young children and single-parent households.

As with changes in real expenditure per calorie, changes in nutritional quality could have been driven by households switching across food groups or by switching across products within them. We take the NPM measure of nutritional quality and compute average changes in the score holding either the quantity shares of the different food groups constant or the average score of each group constant. This allows us to look at what the impact of 'between' versus 'within' substitution was on changes in the NPM score.

Table 4 shows the change in the NPM score between 2005–07 and 2010–12 accounted for by between food group and within group substitution, by household type. In all cases, the between number is negative, meaning households' substitution across food groups lowered the NPM score, and the within number is positive, meaning their substitution to products within food groups contributed positively to the NPM measure of nutritional quality.

A large part of the switching across food groups was towards processed food, and this is an important driver of the changes in nutritional composition of food purchases over this period. One interesting question is whether households that switched more towards processed food bought more or less nutritious food products within that category. We combine sweet and savoury processed food (which together constitute around one-third of total calories purchased), and look at how the change in the calorie share of processed food and the change in the amount of saturated fat per 100g and sugar per 100g of processed food from 2005–07 to 2010–12 varied across household types.

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**Table 4. Change in NPM from between versus within substitution, by household type**

	NPM score Change from 2005–07 to 2010–12	
	Between	**Within**
Single non-pensioners	–0.24	0.02
Single pensioners	–0.35	0.05
Couple non-pensioners	–0.21	0.07
Couple pensioners	–0.31	0.06
Multi-adult households	–0.16	0.08
Single parents	–0.27	0.04
2+ adults, young children	–0.30	0.02
2+ adults, older children	–0.11	0.06
All households	–0.25	0.05

Note: The numbers give the change in the NPM score of food purchased from 2005–07 to 2010–12 accounted for by between and within food group substitution, controlling for month effects and permanent differences in NPM scores across households. Between substitution allows households' quantity share allocated to each food group to vary, but holds what they bought within each group constant. Within substitution allows what households bought within each food group to vary, but holds the quantity share allocated to each group constant. The sum of the between and within terms does not necessarily equal the total change in Table 2 due to an omitted covariance term. See the appendix for more details of the method. All the changes are statistically different from zero at the 99% level, apart from 'Single non-pensioners – Within'.

Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

Figure 8 shows that all household types increased the share of their calories purchased as processed food, and the largest increases were for pensioner and single-parent households. Some household types reduced the saturated fat intensity of the processed food that they purchased (single-parent households did this to the largest degree), while other household types increased the saturated fat intensity of their processed food (couple pensioner households did this the most). Similarly, some household types increased the sugar intensity of their processed food purchases, while others lowered it. Pensioner households were more successful than other household types in substituting away from sugar with processed food, while households with young children increased the sugariness of their processed food the most.

Figure 8. Change (from 2005–07 to 2010–12) in the calorie share of processed food versus change in the saturated fat intensity or sugar intensity of processed food
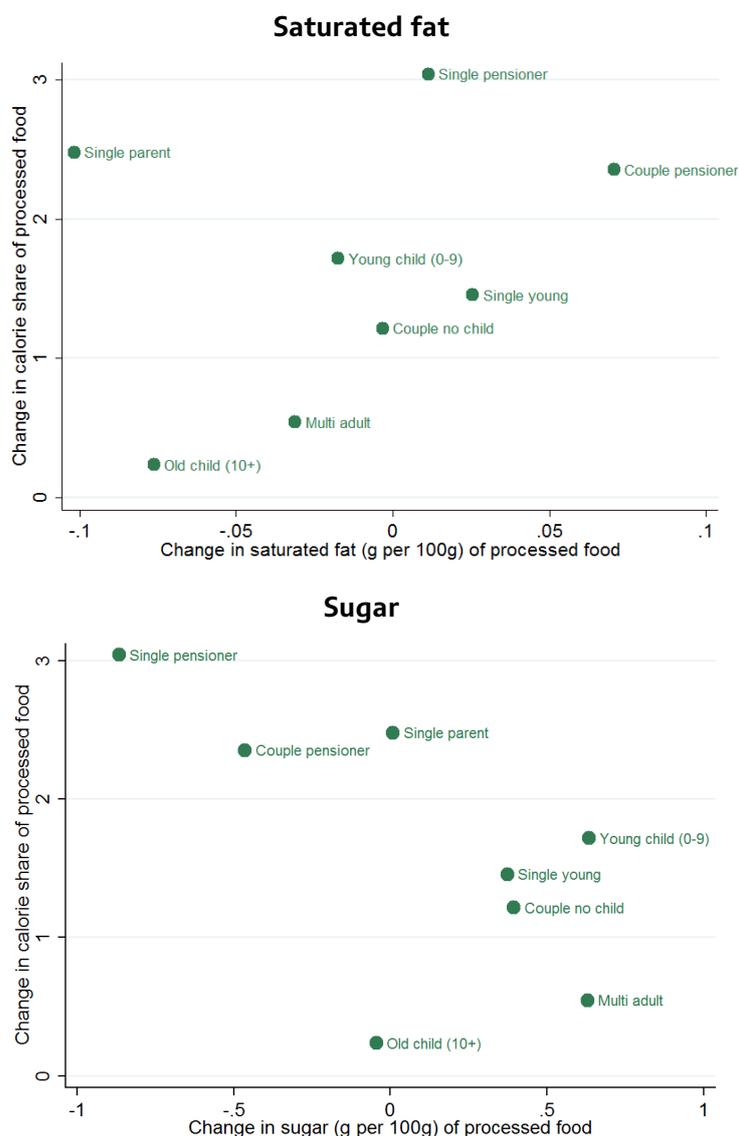
Saturated fat

Sugar

Note: The numbers give the change in each variable from 2005–07 to 2010–12, controlling for month effects and permanent differences in the variable across households. See the appendix for more details of the method.

Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home. See the appendix for details.

5. Summary

This briefing note has described changes in food spending and in the nutritional quality of foods purchased during and since the recession. We showed that, on average, households have reduced calories purchased, but by less than real food expenditure, and hence they have reduced real spending per calorie. The magnitude of these changes varies across household type. Households with children generally changed their

purchases by more than other household types, reducing both their calories and their spending per calorie by more on average. Various measures of nutritional quality declined over this period, with bigger decreases for pensioner households and households with young children. This was partly due to larger shifts to processed food. The substitution to healthier products within food groups was insufficient to outweigh this effect.

In future work, we will explore what mechanisms households used to reduce real expenditure per calorie. It seems that some households were able to reduce real expenditure per calorie without having an adverse effect on the nutritional quality of the foods that they purchased, while others were not. We are interested in whether this was because some households were able to buy more products on sale, switch to cheaper own-brand products or use other ways to economise. This research relates to a broader set of questions about how households are able to insure themselves against adverse shocks, and whether some households are able to do this better than others.

Appendix

Method

To calculate the changes and percentage changes in the variables of interest, we regress each variable on three time-period dummies (2005–07, 2008–09 and 2010–12) and control for month and household fixed effects. We estimate each regression separately by household type. The percentage changes are the coefficient on a dummy for either 2008–09 or 2010–12 divided by the initial mean (in 2005–07).

Data

We use the Kantar Worldpanel for the years 2005 to 2012. These data record spending on all food purchases brought into the home for a representative sample of British households. We select household-months that do not contain any periods of non-reporting longer than 7 days (i.e. we exclude months when households go on holiday). The sample contains 15,850 households. The mean length of time in the panel is 44 (of 90) months. We group households into eight different household types, defined in Table A1.

Table A1. Household types

Household type	Criteria
Single non-pensioners	One member, aged between 18 and 64
Single pensioners	One member, aged 65 or over
Couple non-pensioners	Two members, aged between 18 and 64
Couple pensioners	Two members, at least one 65 or over; no under-18s
Multi-adult households	At least three members, all 18 or over
Single parents	One adult 18 or over, plus at least one under-18
2+ adults, young children	Two or more adults, 18 or over, plus at least one member under 10
2+ adults, older children	Two or more adults, 18 or over, plus at least one member between 10 and 17; no members under 10

We divide real food expenditure and calories purchased by an adult-equivalent index to express them in per-adult-equivalent terms. The adult-equivalent index is based on the estimated average requirement (EAR) for energy of households.[16] We construct the daily EAR of the household as the sum of the EARs for each of its members, which vary by age and sex as shown in Table A2. To express figures per adult-equivalent, we divide the household's EAR by 2500 to obtain an adult-equivalent index (this would equal 1 if the household contained only one adult male).

Table A2. Estimated average requirements (EARs) for energy (calories)

Age	Male	Female
Less than 1 year old	745	698
1–3	1230	1165
4–6	1715	1545
7–10	1970	1740
11–14	2220	1845
15–18	2755	2110
19–50	2550	1940
51–59	2550	1900
60–64	2380	1900
65–74	2330	1900
75+	2100	1810

Source: Department of Health, *Dietary Reference Values for Food Energy and Nutrients for the United Kingdom*, Report on Health and Social Subjects 41, 1991. EARs are provided for four age bands for children below 1. We use the average of these four values.

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[16] Department of Health, *Dietary Reference Values for Food Energy and Nutrients for the United Kingdom*, Report on Health and Social Subjects 41, 1991.

Detailed results

Table A3 shows the changes from 2005–07 to 2008–09 and 2010–12 in real expenditure per adult-equivalent, calories purchased per adult-equivalent, and real expenditure per calorie, for the eight different household types. These numbers are presented in Figures 5–7.

Table A3. Percentage change in food spending, by household type

	Real expenditure		Calories		Real expenditure per calorie	
	% change from 2005–07 to:					
	2008–09	*2010–12*	*2008–09*	*2010–12*	*2008–09*	*2010–12*
Single non-pensioners	–3.3	–5.6	–0.3	0.2	–3.0	–5.7
Single pensioners	–4.9	–9.3	–3.5	–5.6	–1.3	–3.6
Couple non-pensioners	–3.4	–8.7	–1.0	–3.7	–2.3	–5.1
Couple pensioners	–3.5	–8.1	–2.2	–4.1	–1.0	–4.1
Multi-adult households	–2.8	–8.2	–1.1	–4.1	–1.5	–4.2
Single parents	–7.9	–14.1	–5.4	–7.5	–2.5	–6.6
2+ adults, young children	–9.4	–18.0	–5.3	–9.8	–4.3	–9.0
2+ adults, older children	–5.7	–13.2	–3.6	–8.4	–2.1	–4.9
All households	–3.9	–8.5	–1.8	–3.6	–2.1	–5.2

Source: Authors' calculations using Kantar Worldpanel data on food purchases brought into the home.

Composite nutritional quality measures

The nutrient profiling model (NPM) that we use scores each product on a number of dimensions. Each score is based on the amount of a nutrient (or fruit, vegetables and nuts in one case) that the product contains per 100 grams. These scores are then aggregated into a single score. Table A4 gives details of how the points are awarded for each component.

A maximum of 10 points can be awarded for each of energy, saturated fat, sugar and sodium and a maximum of 5 points for fruit, vegetables and nuts, fibre and protein. The total number of 'A' points and the total number of 'C' points are the sum of the points scored for each ingredient:

Total 'A' points = Points for energy + Points for saturated fat + Points for sugar + Points for sodium

Total 'C' points = Points for fruit/veg/nuts + Points for fibre + Points for protein

The overall score is calculated as follows. If a food scores 11 or more 'A' points but also scores fewer than 5 points for fruit, vegetables and nuts, then the overall score is calculated without reference to the protein value:

Overall score = [Total 'A' points] – [Points for fruit/veg/nuts + Points for fibre]

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Table A4. Nutrient profiling model

Points	Negative scores				Positive scores		
	Energy (kJ)	Saturated fat (g)	Total sugar (g)	Sodium (mg)	Fruit, veg, nuts (%)	NSP fibre (g)	Protein (g)
0	≤ 335	≤ 1	≤ 4.5	≤ 90	≤ 40	≤ 0.7	≤ 1.6
1	> 335	> 1	> 4.5	> 90	> 40	> 0.7	> 1.6
2	> 670	> 2	> 9.0	> 180	> 60	> 1.4	> 3.2
3	> 1005	> 3	> 13.5	> 270	-	> 2.1	> 4.8
4	> 1340	> 4	> 18.0	> 360	-	> 2.8	> 6.4
5	> 1675	> 5	> 22.5	> 450	> 80	> 3.5	> 8.0
6	> 2010	> 6	> 27.0	> 540	-	-	-
7	> 2345	> 7	> 31.0	> 630	-	-	-
8	> 2680	> 8	> 36.0	> 720	-	-	-
9	> 3015	> 9	> 40.0	> 810	-	-	-
10	> 3350	> 10	> 45.0	> 900	-	-	-

Source: M. Rayner, P. Scarborough and T. Lobstein, 'The UK Ofcom nutrient profiling model: defining "healthy" and "unhealthy" foods and drinks for TV advertising to children', 2009 (http://www.dph.ox.ac.uk/bhfhprg/publicationsandreports/acad-publications/bhfhprgpublished/nutrientprofilemodel).

Otherwise, the score is calculated as:

Overall score = [Total 'A' points] – [Total 'C' points]

Another measure of nutritional quality that we use is the Healthy Eating Index (HEI). It is calculated on the basis of how calories are distributed across food types and nutrients. Each component is assigned a score based on the amount that is purchased per 1000 calories (in most cases). Table A5 shows how the scores are calculated for each component. If the amount purchased is more than the upper limit for that component, it receives the maximum score indicated in the table. If the amount purchased falls between the lower and upper limits, it receives the maximum score linearly adjusted: for example, if a household purchases 90g of fruit per 1000 calories, its score for fruit would be (90/120)×5 = 3.75. If the amount purchased is less than the lower limit, the component receives a score of zero.

Calories from SoFAAS are calories from (So)lid (F)ats, (A)lcohol and (A)dded (S)ugar. Whole fruit (i.e. all fruit excluding fruit juice) counts under both the whole fruit and total fruit components; dark green and orange vegetables count under both the dark green/orange vegetable component and the total vegetable component; and whole grains count under both the whole grain component and the total grains component.

Table A5. Healthy Eating Index

Component	Maximum score	Lower limit	Upper limit
		(per 1000 calories unless stated)	
Total fruit	5	0	120g
Whole fruit	5	0	60g
Total vegetables	5	0	165g
Dark green and orange vegetables	5	0	60g
Total grains	5	0	75g
Whole grains	5	0	32.5g
Milk	10	0	260g
Meat	10	0	70g
Oils	10	0	12g
Sodium	10	> 2g	< 0.7g
Saturated fat	10	> 15% of energy	< 7% of energy
Calories from SoFAAS	20	> 50% of energy	< 20% of energy