Appendix 1: Rapid Evidence Assessment Findings

Summary of Included Studies

Detailed findings of the included studies are presented in the subsections below. Following the aims of this review and its inclusion criteria, this section is split into five subsections: 1) Food costs for individuals with FHS; 2) Non-food costs of FHS; 3) Review studies on people living with FHS; 4) Studies of cost/burden in other chronic conditions and disabilities, and 5) Statistics on food consumption.

- **The Food costs** section includes studies that reported the cost of restricted diets in FHS individuals. (These are financial costs only)
- The **Non-food costs** section includes studies that looked at lost productivity, time loss due to the FHS and other burdens reported by people living with FHS or caregivers of children with FHS. The non-food costs section also includes studies that reported combined direct or indirect costs of living with a FHS. (These are both financial and economic costs)
- The **Non-FHS studies** section reviews studies reporting on the cost or price differentials for a variety of chronic conditions or disabilities.
- Finally, the **Statistics on food consumption** section reports the statistics available on general food consumption patterns in the UK.

Note that unless otherwise stated, the price year of figures reported is equivalent to the year of the study (or the paper didn't report the price year, generally because they calculated costs directly from supermarkets).

Terminology of Costs

There are a number of different, overlapping ways of categorising costs which can become confusing. The key distinctions are outlined here:

- Food versus non-food costs. For the purposes of our analysis we have made the distinction between the impact of FHS on **food costs**, and all the other impacts of FHS on out-of-pocket costs and time (**non-food costs**).
- Economic versus financial costs. **Financial costs** are those where money changes hands, **economic costs** include both financial costs and elements that carry an opportunity cost for example, time spent reading labels that could be used for something

else. Economic costs are a wider category often used for assessing value for money, whereas financial costs impact on budgets and affordability.

- Cost of illness versus maintenance/management costs. This project is focused only on the costs of remaining well with a FH, i.e. not including the cost incurred by illness. For example, regular medical appointments like check-ups are included, hospitalisation due to illness is not.
- Direct vs. indirect (vs. intangible) costs. Many of the studies we looked at, particularly those not focused on food hypersensitivities, are typically economic burden of disease studies. These look at the main costs incurred as a consequence of a particular health condition. In these studies, typically the distinction is between *direct costs* (usually medical and food costs) and *indirect costs* (usually knock-on impacts of the condition, like the impact on productivity). They can also consider *intangible costs* which relate to quality of life/pain and suffering. Somewhat confusingly this distinction is not well-defined when it comes to the focus of much of this study, for example, non-medical financial costs and time spent including out-of-pocket spend (spend that is directly from an individual's cash reserves) on food, equipment etc. Often these are considered as direct non-medical costs, but sometimes they are included as indirect costs.

Food Costs for Individuals with FHS

The majority of studies looking at the differences in food costs for individuals with FHS compared the cost of gluten-free and non-gluten-free products, perhaps due to the fact that gluten-free products are often clearly distinguished as such. Our search returned eleven such studies, the findings of which are presented in Table 1 below.

Table 1: Studies comparing the price of gluten-free and non-gluten-free food products

Author (Year)	Country	Compared food items	Price
Capacci, Leucci, & Mazzocchi (2018)	UK	All gluten-containing cereal products available in four major UK supermarkets (online shops) and their gluten-free substitutes	Gluten-free products were on average 188% more expensive than their gluten-containing counterparts (£1.12/100g vs. £0.59/100g respectively)

Author (Year)	Country	Compared food items	Price
Fry, Madden, & Fallaize (2018)	UK	679 gluten-free food items from ten categories of food products (brown bread, white bread, breakfast cereals, wholegrain flour, white flour, pizza bases, wholegrain pasta, regular pasta, crackers, biscuits) found in five UK supermarkets (online shops) and 1045 comparable regular products	Gluten-free products were on a 159% more expensive than their gluten-containing counterparts (Median: £1.14/100g vs. £0.44/100g respectively)
Allen & Orfila (2018)	UK	All available gluten-free products (n=49) from four food categories (white bread, brown bread, seeded bread, white past) found in four major UK supermarkets (online shops) and their gluten-containing equivalents (n=61)	Gluten-free products were significantly more expensive across all four product categories, as follows: • White bread: +307% • Brown bread: +314% • Seeded bread: +220% • Pasta: +70%
Singh & Whelan (2011)	UK	Ten wheat-based and 10 everyday food products that frequently contain gluten, available at 30 different stores across five store categories (quality supermarkets, regular supermarkets, budget supermarkets, health food shops, corner shops) and	All 10 gluten-free versions of the wheat-based products were on average more expensive than their standard counterparts (76-518%). Some gluten-free versions of everyday foods were also more expensive (2-124%).

Author (Year)	Country	Compared food items	Price
		their gluten-free equivalents. Four versions of each product were surveyed (branded gluten-free, cheapest gluten-free, branded standard, cheapest standard)	
Burden et al. (2015)	UK	Ten commonly purchased gluten-free food items available in supermarkets and internet shops delivering to homes in a single UK city (Sheffield) and their gluten-containing equivalents	All 10 gluten-free products cost more than their standard equivalents (4.1 times more on average)
Missbach et al. (2015)	Austria	63 gluten-free food products from 19 brands and seven food categories (convenience, snacks, cookie. and cakes, cereals, pasta and cereal-based products, bread/bakery products, flour/bake mix) available in 12 different Austrian supermarkets (three different chains) and 126 equivalent standard products (two standard products per one gluten-free product - one budget, one pricier)	Average cost of gluten-free products was significantly higher compared to gluten-containing products across all product categories (€11.58/kg vs. €6.62/kg), ranging from 205% to 267%.

Author (Year)	Country	Compared food items	Price
Panagiotou & Kontogianni (2017)	Greece	All gluten-free products available in four supermarket chains in Athens, all gluten-free products available in pharmacies and their non-gluten-free equivalents. 24 food categories were represented.	All gluten-free products in supermarkets (except for pasta sauce) were 22-334% more expensive than their standard counterparts. All pharmacy gluten-free products were 88-476% more expensive than their standard counterparts.
Lee et al. (2019)	US	'Market basket' of regular food products (10 food categories: bread, cereals, pasta, crackers, pretzels, cookies, waffles, pizza, macaroni and cheese, cake) and their gluten-free equivalents available across four store categories (traditional grocery store, health food store, upscale market, online) and five geographic regions of the US.	Overall, gluten-free products were 183% more expensive than their non-gluten free counterparts across all food categories.
Lambert & Ficken (2015)	Australia	Gluten-free supermarket basket and gluten-containing supermarket basket for a seven-day meal plan for four different family types (nuclear family, single parent with two children, single elderly female, single	The gluten-free basket was more expensive than the gluten-containing basket on 22 out of 24 occasions (four family types across six areas). Average price differential (cost of food basket per week) across the

Author (Year)	Country	Compared food items	Price
		young male), in which one member required a gluten-free diet. The basket items were priced at two main supermarkets across six suburbs of the Illawarra region in NSW.	six areas was +5.78% for the nuclear family, +11.30% for the single mother, +16.67% for single elderly female, and +15.98% for the single young male.
Arias-Gastelum et al. (2018)	Mexico	Fourteen wheat-based items (and two additional items not suitable for gluten-sensitive individuals) from a 'Mexican market basket' were compared to their gluten-free alternatives available in regular supermarkets and health food stores in five Mexican cities	Twelve of the 14 gluten-free products were significantly more expensive (by 190%-1088%) than their gluten-containing counterparts. The other two products could not be compared due to their low availability.
Estévez, Ayala, Vespa, & Araya (2016)	Chile	Thirty-four gluten-containing items from a basic food basket (53 items in total) and their gluten-free counterparts available in stores (mid-range and wholesale supermarkets) in Santiago, Chile. Only 19 items were analysed, because they were low-priced, similarly to their non-gluten-free equivalents.	The 19 gluten-free items were on average 3x more expensive than their gluten-containing equivalents. The cost of the 19 gluten-free items was US$132.8 person/month compared to US$44.3 person/month for the non-gluten-free equivalents.

In addition to comparing the gluten-free and non-gluten free food products, the above studies also reported the following information:

Product Availability and Cost Differences

- Allen and Orfila (2018) also found that gluten-free products were significantly less available across all four food categories in the UK. The mean number of available gluten-free products ranged between 4 and 11, whereas the mean number of standard products ranged between 23 and 62. The authors also looked at the nutritional profile of the four categories of products and found that gluten free products tended to be higher in fibre and fat and lower in sugar and protein. Additionally, only 5% of all gluten-free breads were fortified with all four fortification minerals (in accordance with UK law for standard breads).

- Singh and Whelan (2011) further found that the prices of different food products varied based on store category, with regular supermarkets generally stocking cheaper gluten-free versions in the UK. In terms of availability, across all stores, only 41% of the 20 food items were available in a gluten-free version per store. The highest availability was found in regular supermarkets (90%) and the lowest availability in budget supermarkets and corner shops (both 9%).

- Burden et al. (2015) found that the difference in cost for different food items was minimal across different store categories in the UK. The availability, however, varied widely, with none of the budget or corner shops surveyed stocking any gluten-free products. Larger supermarkets stocked the most gluten-free products. The median number of items available across all 10 surveyed stores was four.

- Lee et al. (2019) also found that there were differences in prices across geographical regions in the US. The difference in price between gluten-free and conventional product ranged from 162% to 245% based on geographical area. The availability of products also varied by region and store category. Health food and upscale stores had the greatest availability of gluten-free products (66% of the gluten-free market basked products). Traditional grocery store was the cheapest place for gluten-free products, with the mean cost of the gluten-free market basket being $0.45/ounce at the traditional grocery store, and $0.59/ounce online.

- Arias-Gastelum et al. (2018) also looked at the availability of the gluten-free products in Mexican stores and found these to be substantially less available. The availability ranged between 0% and 81% in supermarkets (average 28.8%) and between 6.2% and 62.5% in

health food stores (average 25%). A survey with 36 participants who were following a gluten-free diet on their doctor's recommendation revealed that 33 of them (91.6%) found the diet moderately or very difficult to follow, particularly due to its high cost and the low availability of the gluten-free products. Thirty-five (97.2%) respondents also reported they were afraid of dining out, 32 (88.8%) were avoiding social activities and 30 (83.3%) had difficulties travelling.

- Estévez et al. (2016) further found that in Chile, the gluten-free items were 42% less available and they also had lower protein (24.2% less on average, up to 69% less in breads and cereals) content compared to the comparable non-gluten-free items. The food basket used in the study included 34 foodstuffs that contained gluten or may have been contaminated by it.

Socio-economic impact

- Capacci et al. (2018) further estimated that coeliac consumers in the UK pay on average £10 extra each week for their food, just to keep their pre-diagnosis utility level. This corresponds to 29% of their food budget. Additional analyses revealed that coeliac consumers at different income levels incur the same extra cost in absolute terms, which corresponds to 36% of the food budget of poor consumers (lowest income quartile) and 24% of the food budget of rich consumers (top income quartile).

- Panagiotou & Kontogianni (2017) estimated the economic burden of a gluten-free diet by designing weekly dietary menus for children, adolescents and adults in Greece. The upper energy intake was considered for each age group to estimate the maximum economic burden. They found that this ranged from +EUR12 to +EUR28 per week, depending on the individual's age and place of purchase of the gluten-free products. For children, this was an extra EUR12.12 for supermarket gluten-free products and EUR15.38 for pharmacy gluten-free products. For adolescents, this was an extra EUR23.56 and EUR27.84 and for adults it was an extra EUR18.21 and EUR23.80 respectively.

- Lambert and Ficken (2015) also looked at the affordability of the gluten-free supermarket basket for a seven-days meal for each one of the four family types (nuclear family, single parent with two children, single elderly female, single young male) in Australia and found that with the exception of the single elderly female, the gluten-free supermarket basket was unaffordable for all family types (to be considered affordable, the food purchase had to represent less than 25% of the household's disposable income).

Nutritional impact

- Fry et al. (2018) also compared the nutritional content of the gluten-free and non-gluten-free products in the UK and found that the gluten-free diet is unlikely to offer health benefits compared to regular foods, except for those who require a gluten-free diet. A significantly higher proportion of gluten-free products (65%) were found to contain high or medium content of fat, saturated fat, sugar and salt, compared to regular products. Protein and fibre content were also lower in gluten-free products. 679 gluten-free food items from ten categories of food products (brown bread, white bread, breakfast cereals, wholegrain flour, white flour, pizza bases, wholegrain pasta, regular pasta, crackers, biscuits) found in five UK supermarkets (online shops) and 1045 comparable regular products were used.

- Missbach et al. (2015) further found that across all food categories, the energy content, carbohydrate, fat, saturated fatty acids, fibre and sugar content did not differ significantly between gluten-free and non-gluten-free products in Austria. Protein content was, however, lower in gluten-free products. 63 gluten-free food products from 19 brands and seven food categories (convenience, snacks, cookie. and cakes, cereals, pasta and cereal-based products, bread/bakery products, flour/bake mix) available in 12 different Austrian supermarkets (three different chains) and 126 equivalent standard products (two standard products per one gluten-free product - one budget, one pricier) were used.

Our search returned several other studies that looked at direct food costs in individuals with FHS. As above, some of these studies also looked at indirect costs associated with FHS. These studies are briefly summarised below:

A US study (Wolf et al., 2016) examined the cost of the six-food elimination diet (SFED; which excludes dairy, wheat, eggs, soy, nuts and seafood) required for eosinophilic esophagitis, compared to an unrestricted diet. A dietitian with experienced of the condition, produced calorie- and nutrient-matched menus for a week's worth of meals for the SFED and the unrestricted diet. The menus were used to generate a shopping list and prices of items were surveyed at standard and specialty stores. The results showed that the average weekly price of the SFED diet was $92.54 compared to $79.84 for unrestricted diet, when shopping at standard supermarkets. The availability of the products also varied; 32% of the SFED shopping list items were not available, compared to 3% of unrestricted shopping list items, and would have to be obtained from another store. In specialty stores, the average weekly price of the SFED diet was $106.47 vs. $105.96 for unrestricted diet. Six% vs. 2% of the

shopping list items respectively would have to be obtained from another supermarket. The study also found that compared to the unrestricted diet, the SFED diet generated an overall excess annual cost of $654 when shopping at a standard supermarket.

A study conducted in Finland (Alanne et al., 2012) used a prospective design, where the development of allergic disease (atopic dermatitis, food allergy to cow's milk or wheat, asthma) in infants was followed from birth to 24 months. Sixty children developed allergic disease by the age of two and they were compared with 56 age- and sex-matched controls who had no allergic diseases. Twenty-three infants in the sample developed food allergy, but some of these also had atopic dermatitis, asthma, or both. Data was collected from insurance companies, health care providers, from parents through questionnaires, and from medical examinations. In terms of family dietary costs, the diet of infants with food allergy was a median of EUR47 (mean EUR115) more expensive than that of healthy infants in the first 24 months of their life. Once the insurance company-reimbursed part of the formulae for infants with cow's milk allergy was included, this difference rose to a median of EUR778 (mean EUR2041).

In a related study conducted with the same cohort in Finland, Alanne (2012a) used 3-day diet records to estimate nutrient intake and diet-related costs of 23 infants with food allergy at 6, 12, and 24 months of age and compared them to 57 infants without food allergy. Food prices were obtained from local supermarkets and prices of supplements from a pharmacy. The daily dietary costs of families with infants with food allergy vs. families with healthy infants were EUR1.64 vs. EUR1.21 at 6 months, EUR3.18 vs. EUR2.69 at 12 months, and EUR2.91 vs. EUR2.89 at 24 months (2006 prices). The difference was, however, not statistically significant at 12 and 24 months. The cost was higher for infants on hydrolysed formulae compared to those using soy-, oat-, or rice-based alternatives, or those that were breastfed for longer.

A secondary analysis of cross-sectional survey data (Bilaver et al., 2016) collected from 1,643 US caregivers of a food-allergic child looked at the medical costs borne by the health care system and out-of-pocket costs borne by the families. The study looked at differences based on household income and race/ethnicity and the analyses were weighted to be representative of US children with current food allergies. The survey enquired about the child and household demographics, food allergy severity and reaction history, resource use, lost

productivity, health insurance coverage and willingness to pay for an effective food allergy treatment. Relevant to this report, mean past year cost of special food (adjusted for demographic characteristics) incurred by the families with a food-allergic child was as follows (2010 prices):

Table 2: Adjusted mean past year cost of 'special food' for families with food-allergic children by race/ethnicity, from Bilaver et al. (2016)

Race/ethnicity	Total special food costs
White:	$1,213
African American:	$177
Hispanic:	$219
Asian:	$148
Multiracial/Other/Unknown:	$1,548

Table 3: Adjusted mean past year cost of 'special food' for families with food-allergic children by household income, from Bilaver et al. (2016)

Household income	Total special food costs
<$50,000:	$744
$50,000-99,000:	$941
>$100,000:	$1,545

Using the same sample of 1,643 US caregivers of a food-allergic child, Gupta et al. (2013) looked at the direct medical, out-of-pocket, lost labour productivity, and related opportunity costs due to the child's food allergy. Relevant to this section, the annual cost per child for special diets and allergen-free foods was $285.

Another study (Cerecedo et al., 2014), which utilised a prospective longitudinal cost analysis design, was conducted in Spain and Poland with 42 patients with food allergies (31 of these were children). The study looked at the impacts of a double-blind placebo-controlled food

challenge (DBPCFC), a test considered the gold standard for diagnosing food allergies, on the socioeconomic cost of food allergy. Patients (or parents of patients) completed a questionnaire six months before and six months after the DBPCFC. After the food challenge, patients with negative challenge results reintroduced the food into their diet. The difference in the median total annual direct cost (food, health care, medication, costs of living, leisure activities) from baseline to six months was +813.1 international dollars[1] for the allergic group and -87.3 international dollars for the tolerant group (a statistically significant difference). This was driven by the increase in food costs: six months post-challenge, individuals with confirmed diagnoses of food allergies experienced a median increase in food costs equivalent to 1,257.3 international dollars annually, versus baseline (ie. six months before the food challenge), compared to a zero median change for the allergy-negative group. Note that change in food costs, a component of the direct cost calculation, is higher than the direct cost change, implying cost savings in other components of the direct cost calculation: leisure activities, medication, healthcare, etc.

The difference in the total annual indirect cost (health care, time spent on household tasks, loss of leisure time, time spent on information seeking) was not significantly different between the groups (allergic group: median -32.8 vs. tolerant group: median -538.3 international dollars).

Finally, a US study conducted by Howell (2018) used an online survey with 27 respondents who had been diagnosed with coeliac disease or were caring for someone with coeliac disease to compare the experiences of those living in urban (n = 9) and rural (n = 18) areas. When asked about the additional monthly cost of their specialty diet, participants' estimates varied. One urban and 3 rural participants said between $1 and $100, 4 urban and 6 rural participants said between $100 and $200, 1 urban and 3 rural participants said between $200 and $300, 2 urban and 1 rural participant said between $300 and $400 and 1 urban and 4 rural participants said between $400 and $500. It is difficult to infer very much from these findings, however, given the small sample size.

[1] Geary-Khamis dollar, equivalent to the purchasing power in a given country of 1 US dollar in the US. This paper used 2007 prices.

Non-food costs of FHS

Across the reviewed studies, participants talked about a range of different types of costs associated with their own FHS or their child's FHS. These are summarised below under appropriate headings.

Lost productivity

Studies with caregivers of children with FHS found that the child's FHS was often associated with changes in parents' working hours, lost productivity or job-related opportunity costs (eg. Asthma and Allergy Foundation of America, 2019; Chooniedass et al., 2020; DunnGalvin et al., 2020a; Gupta et al., 2013).

For example, a cross-sectional survey (Gupta et al., 2013) conducted with a representative sample of 1,643 US caregivers of a child with a food allergy found that 9.1% of the caregivers reported a job-related opportunity cost. This was due to the need to change jobs, losing a job, having to give up a job or being restricted in career choices due to the child's food allergy. By assessing the hours of work lost and multiplying this by the mean hourly wage rate, the annual opportunity cost due to forgone labour market activities was estimated to be $2,399 per child (2011 prices).

In a cross-European study on peanut allergy (DunnGalvin et al., 2020a), which utilised semi-structured interviews conducted with children, teenagers and caregivers of a peanut allergic child, a quarter of the caregivers (out of a total of 44) reported that they had to take time off work to supervise their children on school trips, appointments or other activities, and a quarter had to reduce their working hours, with some feeling that this negatively affected their career progression.

A Canadian study (Chooniedass et al., 2020), which utilised focus groups with 40 parents of a child with food allergy, also reported negative impacts on the families' finances due to changes in caregivers' work schedules. Some caregivers needed flexible jobs to be able to be present for school activities, others reported missing work in order to accompany their child to events or appointments and others decided to leave their job completely in order to home-school their child.

Yet another study (Ferretti, Branchi, Dell'Osso, Conte, & Elli, 2017) conducted in Italy with 55 caregivers of a child with coeliac disease, who were administered self-report questionnaires, found that despite the diagnosis resulting in a higher burden on the family, social and economic domains, the caregivers' working habits were minimally affected.

Time spent on food shopping and food preparation

The amount of time needed for food shopping, food preparation and planning for food shopping was reported in multiple studies as a major burden on person living with FHSs as well as parents of children with FHS (Asthma and Allergy Foundation of America, 2019; Bilaver et al., 2016; Broome, Lutz, & Cook, 2015; DunnGalvin et al., 2020a; Komulainen, 2010; MacKenzie, Grundy, Glasbey, Dean, & Venter, 2015; Neil, 2012; Peniamina, 2014; Peniamina, Bremer, Conner, & Mirosa, 2014; Peters, Crocker, Jenkinson, & Violato, 2020; Sommer, MacKenzie, Venter, & Dean, 2012; Stjerna, Vetander, Wickman, & Lauritzen, 2014). The following bullet points illustrates the burden involved in shopping for and preparing allergy-safe food:

Time spent on:

Planning for food shopping:

- Preparing two different menus; one for the child with FH, one for the rest of the family
- Calling manufacturers to ensure the food is safe

Learning about the food allergy and suitable food products

Shopping:

- Having to visit multiple shops due to low availability of allergen-free food products
- Travelling to speciality food stores
- Travelling quite far to buy safe food (depending on where they live)

Reading food labels (some people read all the labels every single time, because ingredients can change)

Preparing food:

- Cooking from scratch to ensure adequate nutrition

The studies reporting the above results were conducted in Europe (UK, France, Germany, Ireland, Spain, Italy, Denmark, Netherlands, Sweden), US, Canada and New Zealand and utilised cross-sectional self-report surveys, interviews and focus groups to collect data from adults with FHS and parents of children with FHS.

Eating out and socialising

A lot of studies conducted with adults and adolescents with FHS, and also parents of children with FHS, reported that eating out with food allergies can be a challenge and is often avoided, which then limits the opportunities for social interactions (Abrams, Kim, Gerdts, & Protudjer, 2020; Abrams, Simons, Roos, Hurst, & Protudjer, 2020; Allen, Bidarkar, van Nunen, & Campbell, 2015; Asthma and Allergy Foundation of America, 2019; Barnett et al., 2017; Barnett, Vasileiou, & Lucas, 2020; Benson, Albakri, & Windle, 2019; Bilaver et al., 2016; Brome et al., 2015; DunnGalvin et al., 2020a; DunnGalvin et al., 2020b; Komulainen, 2010; Kovacs, 2018; MacCulloch & Rashid, 2014; MacKenzie. et al., 2015; MacKenzie, Roberts, van Laar, & Dean, 2010; NatCen Social Research, 2017; Peniamina, 2014; Peniamina et al., 2014; Peters et al., 2020; Sommer et al., 2012; Sommer, MacKenzie, Venter, & Dean, 2014; Neil, 2012; Stjerna et al., 2014; Voordouw et al., 2016). Eating out and socialising were often interlinked in the reviewed studies and this is well captured by one of the studies, which showed that “managing a [food allergy] outside the home involves dilemmas of managing health and social risks” (Barnett et al., 2020, p.7).

Although assessing psychological/quality of life burdens of FHS is beyond the scope of this study, we summarise the results on the burden associated with eating out and socialising reported across the studies we included, which were largely similar:

Burden associated with eating out and socialising:

Difficulties eating out:

- No spontaneous decisions to eat out
- Some participants reported not eating out at all
- Bringing home-made food for their child when they are eating out
- Bringing own food to social events
- Avoiding certain restaurants
- Feeling restricted/limited in choosing where to eat out
- Always eating in the same restaurants that one knows are safe
- Always ordering the same thing that one knows is safe
- Difficulties finding safe foods when eating away from home
- Researching restaurants and their menus before leaving house
- Contacting the restaurants beforehand to enquire about allergen information
- Always asking restaurant staff about allergen information

- Having to take risks by eating foods that may contain allergens or having to go hungry/not eat
- Feeling like a difficult customer when having to explain about food allergies to restaurant staff
- Feelings of fear and worry due to the risk of cross-contamination
- Being worried about having a reaction when eating out.

Restricted social life:

- Some parents do not allow their child to go to parties, others do not allow the child to go by themselves
- Caregivers having to contact the host of a social event to enquire about food and make them aware of their child's allergy
- Children being excluded from age-appropriate activities (camps, sleepovers, school trips, birthday parties), because other parents do not want to take on the responsibility
- Extra planning needed for special events/activities
- Avoiding social events
- Not joining activities that involve food
- Feeling anxious or stressed out when participating in social occasions involving food, some also felt worried during occasions not involving food
- Feeling isolated and excluded from social activities
- Feeling limited when planning social activities
- Not having people over for meals and gatherings meant a loss of friends for some

The studies summarised in the table above used surveys, interviews and focus groups to collect data. They were conducted in several European countries, the US, Canada, New Zealand and Australia.

Of interest for the scope of this study, i.e. for cost implications, are two studies (Benson, Albakri, & Windle, 2019; NatCen Social Research, 2017), which utilised data from waves 1-5 of the Food and You survey, a cross-sectional survey of adults living in private households in the UK. The studies compared people living with FHS and people without and found no significant differences between the two groups on how frequently they eat outside of home.

Travelling

Travelling has also been identified as an area of difficulty by individuals with FHS in the reviewed studies (Bilaver et al, 2016; Brome et al., 2015; Komulainen, 2010; Peters et al., 2020; Asthma and Allergy Foundation of America, 2019; DunnGalvin et al., 2020a; Abrams et al., 2020). The below studies were conducted in several European countries, the US and Canada. They used surveys and interviews and found that:

- Family's vacation choices can be restricted due to a child's food allergy (Bilaver et al., 2016; Komulainen, 2010)
- Some individuals do not travel very much due to their FH, which means they see their family less (Brome et al., 2015)
- Sourcing safe food can be challenging when travelling (Peters et al., 2020)
- Travel needs to be planned ahead and families are usually self-sufficient (eg. they bring their own appliances on holidays) (Abrams et al., 2020)
- Some families had to cancel or alter their vacation plans due to their child's food allergy (Asthma and Allergy Foundation of America, 2019)
- Travelling means packing the emergency kit, checking expiration dates on medications, preparing food and determining the distance of the destination to the nearest hospital beforehand (DunnGalvin et al., 2020a)

Health and Wellbeing

A large number of studies looked at the health and wellbeing of individuals with FHS, particularly quality of life (Abrams et al., 2020; Alanne 2012b; Allen et al., 2015; Barnett et al., 2017; Brome et al., 2015; Jansson et al., 2014; DunnGalvin et al., 2020a; DunnGalvin et al., 2020b; Flokstra-de Blok et al., 2010; Komulainen, 2010; Ludvigsson, Roy, Lebwohl, Green, & Emilsson, 2017; MacKenzie. et al., 2010; MacKenzie. et al., 2015; Mikkelsen, Borres, Björkelund, Lissner, & Oxelmark, 2013; Patel, 2010; Peniamina, 2014; Peniamina et al., 2014; Protudjer et al., 2015; Protudjer et al., 2016; Roy et al., 2016; Springston et al., 2010; Stjerna et al., 2014; Voordouw et al., 2010; Voordouw et al., 2012; Wai et al., 2019).
As with other non-cost-related burdens, this is out of the scope of this study, but the following provides a summary of the findings from the papers we included:

Health and wellbeing burden associated with FHS:
Compared to healthy controls, people living with FHSs (or caregivers of people living with FHSs) report:

- Lower overall wellbeing
- Lower overall health status
- Lower health-related quality of life
- Higher levels of anxiety and depression
- Higher levels of stress
- More nutritional concerns

People living with FHSs or their caregivers also reported:

- Negative emotional impact of the FH, particularly around the diagnosis time
- Feeling anxious (for example, about whether food is safe to eat, at social occasions involving food, about leaving child in others' care)
- Concerns about nutritional adequacy of allergen-free food and one's health in general
- Feeling overwhelmed and alone, isolated, stigmatised, or even defective
- Feeling sadness, stigma, fear, worry, frustration, uncertainty, annoyance, stress, embarrassment
- Being constantly alert
- Being bullied or made feel different in a negative way because of FH
- Questioning own parental competency
- Low relationship satisfaction and sexual satisfaction

The above studies utilised data from survey questionnaires, linked secondary datasets, interviews, focus groups and daily diaries and were conducted across Europe, the US, Canada, Australia, and New Zealand.

Other studies reported demographic differences in the health and wellbeing of individuals with FHS. For example, caregivers with lower educational levels and those who were unemployed had higher levels of stress compared to those with higher education levels and those who were employed (Ferretti et al., 2017); caregivers who were single, divorced or widowed had lower quality of life compared to those who were married or cohabiting and those who were employed had better quality of life compared those who were unemployed (Knibb & Stalker, 2013); lower income families had lower quality of life compared to higher income families (Howe, Franxman, Teich, & Greenhawt, 2014; Violato & Gray, 2019); quality of life worsens with age (Miller et al., 2020); and mothers report greater psychological

empowerment to care for their child's food allergy than fathers, but they also report lower quality of life (Warren et al., 2015).

Another study worth mentioning separately was conducted with 1,234 parents of US children with food allergies, who completed an online survey. Parents reported major impacts on their own mental, social and emotional wellbeing and 31% of them reported seeing a mental health professional in relation to their child's food allergy (Asthma and Allergy Foundation of America, 2019).

An interview study conducted in Canada with 13 low-income adults with food allergies and ten key informants who work with low-income families in the context of food allergies, found that individuals who rely on food banks report feeling stressed due to the difficulty of obtaining allergen-free foods, as food banks in Canada do not substitute the allergen food, but instead simply remove it from the hamper. These participants also felt unsafe at discount supermarkets, compared to regular supermarkets, due to perceived higher risks of cross-contamination in the former (Minaker, Elliott, & Clarke, 2014a; Minaker, Elliott, & Clarke, 2014b).

Another survey study (Shah et al., 2014) conducted in the US with 341 individuals with coeliac disease and a comparison group of 368 non-coeliac disease patients with other conditions (gastroesophageal reflux disease (GERD), irritable bowel syndrome, inflammatory bowel disease, hypertension, diabetes mellitus, congestive heart failure, end-stage renal disease (ESRD)), found that compared to the other conditions, coeliac disease patients rated their health status higher than any other group (mean score of 81.61 out of 100, using a Visual Analogue Scale), and their perceived treatment burden was higher than that of patients with hypertension and GERD and comparable to those with ESRD (mean score of 44.9 points on the Visual Analogue Scale, where 0 represented very easy and 100 very difficult).

Other areas of difficulty

Studies have also mentioned other areas of difficulties, such as having to make certain home adjustments due to the FH, such as completely eliminating allergens from one's home (Brome et al., 2015), or having a dedicated work surface in the kitchen where allergen food can be prepared for other members of the family (Abrams, Simons et al., 2020). One study

also mentioned that a child with FHS has their own glass and plate at the nursery (Stejrna et al., 2014).

Childcare issues have also been highlighted as an area of difficulty, for example, a denial of childcare provision due to child's food allergy (Minaker et al., 2014b) or the high costs of childcare due to safety issues and liability (Brome et al., 2015).

Yet another study reported that compared to healthy controls, individuals with FHS were more likely to have experienced a break down in their relationship or they have delayed having children/expanding their family (Voordouw et al., 2016).

Combined Costs of FHS

Several reviewed studies presented the costs of FHS as a total figure, combining different areas of cost (including food, healthcare and other out-of-pocket costs). These studies are presented below individually, as they all calculated the total costs in different ways:

- A questionnaire survey study (Protudjer et al., 2015) conducted in Sweden with parents of 226 children (aged 0-12 years) and adolescents (aged 13-17 years; 84 allergic children and 60 allergic adolescents; 94 control children and 56 control adolescents) looked at the differences between cases and controls in terms of total annual household cost. This was the sum of annual direct (costs related to living, consulting, medications, health insurance, travel to visit child/adolescent in hospital or to visit health care professionals) and indirect (costs related to losses of time and productivity and opportunity costs) costs. The results showed that the total household costs were significantly higher for cases than controls, both in children (higher by EUR3,961) and in adolescents (higher by EUR4,795). Overall direct annual household costs were significantly higher in cases than controls in children (higher by EUR2,085), but not adolescents. In terms of overall indirect costs, these were significantly higher in cases than controls in children (higher by EUR1,876), but not in adolescents. (2014 prices.)

- Another questionnaire study (Jansson et al., 2014) conducted in Sweden with 81 adults with food allergies and 85 age and sex matched controls looked at the differences in household costs between the two groups. Total annual household cost included the sum of direct costs (medical treatment, drugs, travel, help with domestic duties, food, leisure activities) and indirect costs (lost hours owing to healthcare visits, hospitalization, grocery shopping, food allergy information seeking, lost productivity and opportunity costs) and it

was found to be significantly higher for cases than controls (by EUR8,164 per annum). This difference was largely due to the indirect costs (higher in cases by EUR6,424 per annum), as the direct costs did not differ significantly between cases and controls.

- A US study (Bilaver et al., 2016) analysing secondary survey data collected from a representative sample of 1,643 caregivers of food allergic children looked at the direct medical and out-of-pocket costs borne by families with food allergic children, separately for different racial and income groups in the US. Relevant to this section of the review were the out-of-pocket costs, which included health care-related items (co-payments, travel expenses), medication, counselling and mental health services, legal guidance, school, camp, childcare and special food (the cost of special food was reported in the food costs section). The results are presented in the table below. It should be noted, however, that the differences between the groups were not statistically significant (although low non-white sample size may have been a factor, the sample was 74% white). (2010 prices.)

Table 4: Costs by race/ethnicity and by household income from Bilaver et al. (2016) (n=1,643)

Race/ethnicity:	**Total out-of-pocket costs**	**Total mental health and legal costs**	**Total school, camp and childcare costs**
White:	$4,203	$78	$1,107
African American:	$395	$11	$46
Hispanic:	$1,093	$2	$31
Asian:	$1,327	$3	$149
Multiracial/Other/Unknown:	$6,577	$447	$1,199

Household income:	**Total out-of-pocket costs**	**Total mental health and legal costs**	**Total school, camp and childcare costs**
<$50,000:	$3,174	$59	$529
$50,000-99,000:	$3,434	$85	$716
>$100,000:	$5,062	$119	$1,592

- Another study (Voordouw et al., 2010) using survey methodology, conducted in the Netherlands and UK, compared the household costs of families with a food allergic member (126 respondents) and families without food allergies (64 respondents). Direct costs included travel costs for medical treatment, expenditure on food, holiday expenses, additional equipment required to prepare safe meals and domestic help. Indirect costs included time lost, lost productivity and opportunity costs, including time spent obtaining health care, shopping for safe foods, lost leisure time and time spent on searching for more information about food allergy. The results showed that the total direct cost for households with food allergic members was not significantly different from the cost for households without food allergic members, but the former incurred a significantly higher indirect cost (by EUR2,758 per annum). Total costs value of time spent on food shopping and preparing food, time spent visiting household members in the hospital and time spent with all health professionals were not significantly different between cases and controls. The following table shows the breakdown of indirect costs (incremental) that were significantly different between cases and controls (note that this does not add up to the total as only statistically significant differences are included in the table below):

Table 5: Costs from Voordouw et al. (2010) (n=126 families with a food allergic individual, n=64 without)

Total costs value of…	**Incremental cost per annum**
… lost time being unable to perform domestic tasks due to sick household member	EUR2,199
… seeking information on food allergy	EUR122
… lost earnings	EUR458

- Another survey study (Wai et al., 2019) conducted in Sweden compared the direct and in-direct household costs between 70 parents of a food allergic child and 70 parents of age and sex matched controls. Direct costs included medical-related costs (eg. co-payments), food expenses, including food preparation, transportation and lost wages due to healthcare visits. Indirect costs included the caregivers' productivity and opportunity losses due to their child's food allergy. It was found that total annual household costs did not differ between the two groups. However, total direct household costs were significantly

higher in cases than controls (by EUR285.82), but there were no significant differences in the total indirect household costs (in terms of the cost of time losses). (2018 prices.)

- Finally, a survey study (Voordouw et al., 2016) conducted in Netherlands, Poland and Spain with 584 individuals with FHS (or their parents) and 974 healthy controls, compared the direct and indirect costs associated with FHS in the two groups. The direct costs included medical treatment not covered by insurance, travel to obtain medical treatment, medication, cost of health insurance and costs of living (incl. food, holidays, leisure activities, equipment required to prepare safe meals, domestic help). Indirect cost included lost working days, loss of education or working opportunities, lost earnings, lost human capital, time spent searching for health-related issues and time spent obtaining medical treatment. The results showed that across countries, the average direct and indirect costs for households with FHS individuals are not higher than those of households without FHS individuals.

FH-related Review Studies

We included in our search reviews that looked at the financial or economic burden of living with food hypersensitivities.

Bilaver et al (2019) reviewed studies on the economic burden of food allergy. Eleven studies were included. Four of these studies were from the EuroPrevall project (a multinational initiative to understand the impacts of food allergy) using a specifically developed questionnaire for assessing household-level economic burden. The remaining papers either used direct questionnaires or analysis from existing surveys to calculate cost. They reported on direct medical costs (out of scope for this study), out-of-pocket costs (medical and non-medical), and opportunity costs (loss of potential earnings and potentially loss of leisure or household production time).

Out-of-pocket costs per annum averaged $1,874 across two studies looking at individual costs, $3,339 across four studies looking at household costs and $1,405 per child in one study looking at a broad range of costs incurred as a result of food allergy. Cost categories included visits to physician or Emergency Department (including co-payments); travel (for visits); cost of living (food, equipment, domestic help); medications; diet and food; health insurance and childcare, schools, camps and/or counselling. According to the authors, the “highest proportion of out-of-pocket costs stemmed from caregiver estimates of changes in

childcare, special schools or camps, and counselling because of allergy ($349.02 per patient) followed closely by the cost of special diets and allergen-free foods ($319.84)."

On opportunity costs, five studies had calculated estimates. Mean individual-level productivity lost was valued at $1,038 across three studies, and at the household-level was valued at $4,881 across three studies. Giving up jobs or choosing different jobs was the main component of this. Most of the studies valued lost household task time, and time spent information seeking, as well as lost work time. (2018 prices.)

White et al. (2016) looked at the burdens of coeliac disease and the gluten-free diet, with specific focus on adolescents in studies worldwide. (They also considered factors associated with adherence and impact on health-related quality of life, beyond the scope of this study.) A Canadian study (n=3,408) reviewed suggest that 60% of participants had difficulty finding GF foods, 48% avoided restaurants and 25% avoided travelling. Another Canadian study (n=222) found that CD patients spent more time, energy, and money on food and food preparation as well as consumed more home-made meals.

In looking at the economic burden, they covered a study from the USA comparing cost and availability of foods in standard and gluten-free 'market baskets', reporting large variations in cost and availability by different supermarkets and an overall additional cost of 240%. A similar Canadian study found 242%, an Australian study also found the gluten-free healthy eating basket to be significantly more expensive than a gluten-containing equivalent. In the UK, one study identified ten wheat-based products and ten everyday products and found gluten-free versions to be available in only some places, and 76-518% more expensive.

Polk and Dinakar (2017) looked at patient-centered outcomes in food allergy for adults, which included a section on economic impact. They reported on one study of population-level costs in the US which found costs incurred by the family totalling $20.5 billion annually, including lost productivity ($0.77 billion relating to caregiver time off work for medical visits), out-of-pocket costs totalling $5.5 billion (31% based on the cost of special foods) and opportunity costs (leaving or changing jobs) totalling $14.2 billion. They also report that "Allergy friendly foods on average cost two to four times more than food that contain common allergens and gluten".

Mogul et al. (2017) looked at "the unknown burden and cost of celiac disease in the U.S." As well as looking at incidence, prevalence, morbidity, mortality and quality of life impact, they reviewed four studies that looked at the cost associated with coeliac disease (three from the US, one from the UK). Only one provided figures on non-medical costs, a US study which "found that gluten-free products were consistently more costly, in some cases more than double the equivalent gluten-containing product".

Patel et al. (2017) looked at the emotional, social, and financial burden of food allergies on children and their families. In terms of financial impact, one study reported annual out-of-pocket costs incurred by families of $931 per child, including travel, medications, school changes, camps and allergen-free food. Looking at diets specifically they report that on average the annual cost of special diets and allergen friendly foods was $285 per child. Lost productivity was $130 per child with opportunity cost (cost related to forgone labour market activities) estimated at $2,399 per child including restricted career choices and leaving a job.

Mearns et al. (2018) reviewed literature on the economic burden of coeliac disease in North America and Europe. Although the majority of the study focused on medical costs, they also reviewed the cost of gluten-free foods and absenteeism and performance due to coeliac disease, Six studies examined the cost and availability of gluten-free foods, all finding they were significantly more expensive than gluten-containing equivalents. They included the studies from Canada and US reported in White et al (2016) above, as well as a study from Greece estimating the weekly economic burden ranging from EUR12 to EUR28 per person (2017 prices). They found three studies on absenteeism based on postal questionnaires, finding that diagnosis and treatment of coeliac disease reduced absenteeism.

Dyer et al (2020) looked at the cost of food allergy, considering – as well as medical costs – out-of-pocket costs (listing: allergen-free food products, medications, transportation costs, co-payments, deductibles and coinsurance) and reporting on a study that found the total burden in the US of $5.5 billion annually, as well as reporting the findings from Bilaver et al. (2019). On household level lost opportunity costs they note that "the majority of food allergy-associated costs are borne by families themselves at the household level with the goal of preventing an unintentional ingestion" and that these are significant across several studies reviewed. Again, they report findings from the Bilaver review.

Warren et al. (2020) looked at the epidemiology and burden of food allergy, with an economic burden section reviewing studies already mentioned above.

Tarantino (2016) assessed the financial burden to households of allergies to staple foods (ie. hen's eggs, cow's milk and/or wheat). Two studies were found, both from Sweden. Both used the FA-ECOQ (Prevalence, Cost and Basis of Food Allergy across Europe) to collect data on costs. The first (n=84 children; n=60 adolescents) found total additional household costs per annum (above the control group) of EUR8,164 (for adults, 2011 prices); the second (n=81 for households with allergies; n=85 for control groups) found cost differences per annum of EUR3,691 for children and EUR4,792 for adolescents (2011 prices).

Dierick et al. (2020) looked at the burden and socioeconomics of asthma, allergic rhinitis, atopic dermatitis and food allergy in studies from all over the world. Relevant elements for this study were the indirect costs considered (absenteeism and presenteeism). They reported findings on absences from school and work for asthma and allergic rhinitis but not food allergies.

Fedorak et al. (2012) looked at the impact of coeliac disease in Canada. On economic costs, they considered direct medical costs and costs of a gluten-free diet (as indirect costs), reporting figures discussed above (in White et al. 2016).

Studies of cost/burden in other chronic conditions and disabilities

Our search looked for studies in comparable areas to food hypersensitivities, such as other chronic conditions and disabilities, that had a focus on estimating the economic or financial burden of those conditions. As establishing health costs is out of scope for this study, we have excluded studies that focused only on this. At full text stage, we also excluded studies that estimated costs using U.S. insurance claims data, as this does not translate usefully to a UK context.

Our focus for these papers was the methods used to generate an estimate, rather than the results per se, and so this section focuses on those.

The vast majority of studies were **'economic burden of disease'** type studies that generally considered three categories: the direct costs of the condition, the quality of life impact of the condition and the indirect costs of the condition.

Direct costs usually encompass healthcare/medical costs, although sometimes direct non-medical costs were included, such as travel, equipment or diet costs. These latter costs are in scope for our study. Indirect costs are generally defined as productivity impact although direct non-medical costs are sometimes included here, as are other non-financial elements such as informal caregiver time. Intangible costs relate to quality of life impacts and are out of scope for this study.

Many of the studies covered used existing **national databases** or **panel surveys** (ie. representative longitudinal studies of a population) to gather data, sometimes including regression analysis or similar forms of analysis to assess cost by disability/illness:

- Gaskin (2012), who assessed the economic costs of pain in the US through existing panel data, using the 2008 Medical Expenditure Panel Survey to assess time missed from work due to pain conditions and using hourly wages to value this. They gathered information on days missed and on hours missed in order to capture sick days used and reductions in working hours
- Guy et al. (2017) also use the Medical Expenditure Panel Survey to assess the prevalence and economic effect of chronic conditions among survivors of cancer in the US. The relevant elements to this study they include were productivity loss calculated from employment disability, missed workdays and additional days spent in bed. Lost household productivity was measured based on the number of additional missed, other than work/school, in which at least half a day was spent in bed due to illness or injury. Productivity loss was valued using median US wages.
- Gupte-Singh et al. (2017) also used the Medical Expenditure Panel Survey in their study on the economic burden of attention-deficit/hyperactivity disorder among paediatric patients in the US. By cross-referencing children's missed school days with average US wages, they calculated loss of productive days to parents
- Chevreul et al. (2013), who assessed the cost of stroke in France based on national databases and work from existing studies on the proportion of working-age stroke survivors in work

- Cloutier et al. (2015), assessing the societal costs of bipolar I disorder in the US, used existing literature and governmental publications to assess indirect costs, covering productivity loss from unemployment, reduced productivity at work, productivity loss from premature mortality and caregiving costs. (This drew largely on an existing employment-to-population ratio for individuals with BDI.) Costs were estimated using the human capital approach (ie. valuing lost productivity by its wage value)
- Ghosh (2013) estimated the economic wellbeing of families with more than one child with disabilities, in the US. They used the Survey of Income and Program Participation which contains measures on disabilities, material hardship and income poverty
- Campbell et al. (2013) looked at the burden of multiple sclerosis in the US, using nationally representative data from the Medical Expenditure Panel Survey to estimate direct costs, indirect costs in terms of wage losses and absences, and health-related quality of life
- Leigh (2011) combined a variety of primary and secondary sources to estimate the national costs of occupational injury and illness among civilians in the US. US datasets on work-related injury and illness were used to estimate current and future lost earnings, fringe benefits and home production (ie. unpaid house and care work), valuing these based on estimates in the literature
- Cullinian et al. (2011), assessed the extra cost of living for people with disabilities in Ireland by comparing income, disposable income/standard of living metrics and disability from a longitudinal study. This was intended to provide a top-down overall estimate of the cost of disability.
- Dall et al. (2010) assessed the economic burden of diabetes in the US, combining multiple sources into a model. The indirect cost element captured was productivity, measured through information from the National Health Interview Survey on workdays lost per year
- Popova et al. (2015) looked at the economic burden of Fetal Alcohol Spectrum Disorder (FASD) in Canada, using existing literature on the work impacts of FASD due to morbidity and mortality and cross-referencing this with employment and wage data from Statistics Canada
- Jhaveri et al. (2019) conducting a cross-sectional study using data from the US's National Health and Nutrition Examination Survey to assess the economic burden of nocturia. They used measures for weekly hours worked and employment, cross-referenced with average US wages, to calculate productivity loss

- Wittenborn et al. (2013) looked at the economic burden of vision loss and eye disorders among the US population younger than 40. They included cost of lost productivity using data from the US Survey of Income and Program Participation and used published estimates to assess costs of informal care, low vision aids, special education, school screening, government spending and transfer payments.

Some studies used **direct surveys, interviews or cost diaries:**

- Einfeld et al. (2010) looked at the costs of caring for children with intellectual disabilities in Australia through a modified version of the Client Service Receipt Inventory (CSRI) administered to parents or carers, covering costs including speech therapy, special education needs, certain food, home adaptations and loss of income, and cross-referencing these with the level of disability . The CSRI itself is "a research instrument developed … to collect information on service utilisation, income, accommodation and other cost-related variables."
- Dean et al. (2019), looking at the cost differences between US breast cancer survivors with or without lymphedema, used 12-monthly cost diaries based on the Goossens' cost diary to collect out-of-pocket expenditure and lost productivity. As well as health costs, this included elements such as wellness resources (eg. gym membership), transportation, nutritional supplements. Productivity elements were collected through questions on number of days in which participants couldn't carry out usual activities and/or needed help (including payments for domestic assistance). This was valued using median wages.
- Souliotis et al. (2017) looked at the annual direct and indirect costs of adults with asthma in Greece through a questionnaire administered to physicians, asking about caregiver time and work loss days due to sick leave prescribed by the physician
- Gimenez et al. (2014), assessing the economic burden of myelofibrosis in Spain, produced a questionnaire which included questions on limitations on daily activities and the consequence implications for productivity and the need for formal care
- Yang et al (2020) estimated the current and future economic burden of Parkinson's disease in the US. The relevant elements from the scope of this study were indirect and non-medical costs of Parkinson's disease, eg. cost of hiring professional non-medical caregivers, home modification costs and increased transportation costs, assessed through a primary survey.

One study, Etchegary et al. (2015) was a **qualitative inquiry** into the perceived economic burden associated with an inherited cardiac condition, carried out in Canada. Through semi-structured interviews, the authors identified themes of financial burden: economic deprivation during childhood due to death of a parent, impact on career choices and the types of work that can be done, impact on disposable income due to illness and travel for appointments, impact on attainability and affordability of insurance. Some participants reported no economic burden, however.

We also looked at **reviews** covering this topic:

- Stabile (2012) looked at literature across the world on the costs of childhood disability, covering indirect costs in terms of productivity impacts and receipt of benefits, collected directly through surveys or using panel data.
- Deb et al. (2017) reviewed literature looking at the cost of managing Alzheimer's disease and related dementias in the US, and included indirect costs in terms of informal caregiving, productivity loss (and productivity loss for informal carers). This was scarce but where available measured in terms of hours per month and valued based on the replacement cost of hiring paid formal care or the opportunity cost of lost wages.
- Sexton et al. (2015) looked at the epidemiology, treatment, psychosocial impact and economic burden of the co-occurrence of Reading Disorder and ADHD in studies around the world. Only one study reviewed looked at the economic burden: parents of participating children completed a questionnaire including time lost from work for parents and hours of extra school assistance
- Two studies: Shaughnessy et al. (2017) and Skaer (2014) were not systematic reviews but summaries of evidence, discussing the economic cost of mental diseases in the US and fibromyalgia in studies worldwide, respectively. Both found several studies reporting productivity losses and Shaughnessy found evidence of in-work productivity losses (which, unlike absenteeism and job loss, is rarely quantified).
- Salas (2012) looked at the burden of restless legs syndrome in the US, and found two papers that reported a productivity impact, covering both work absence and presenteeism (reduced productivity at work due to illness)
- Mitra et al. (2017) examined the literature on extra costs of living with a disability in studies on a global scale, in a systematized (not systematic) review. They found a variety of methods being used: asking directly about goods and services used (ie. spending); asking about goods and services required (what's needed to perform tasks the

individual currently can't do); and the expenditure equivalence/Standard of Living approach, which looks at how much extra income would be required to match wellbeing to someone without the disability and the same income (this can be done by measuring income and then a proxy measure for standard of living, such as asset ownership). Eight papers in the review use the Standard of Living approach, six provide descriptive analysis, five use multivariate regression analysis and two mixed methods based on qualitative and survey data.

- Coyne et al. (2014) reviewed studies on the economic burden of urgency urinary incontinence (UUI) in the US. One included study measured work productivity impact using data from an existing study, another looked at direct non-medical costs (eg. pads, diapers, laundry and dry cleaning) through the use of a direct survey, asking about cost per week.
- Rehman et al. (2018) produced a systematic review on the economic burden of chronic obstructive pulmonary disease (COPD) in the US, Europe, and Asia. In terms of indirect cost, they found that six studies estimated work production loss due to sick days and early retirement, using the human capital approach (valuation using wages) and the friction cost method (valuation using wages only for an adaption period based on the notion that the job will be replaced)
- Patel et al (2014) specifically looked at indirect costs as they relate to COPD in the US, with a focus on the burden to employers and to individuals. They found eleven relevant studies: eight were survey-based and three were retrospective analyses using claims data. Outcomes included were: prevalence of workforce participation, annual days of absenteeism and presenteeism, activity limitation, bed days, short-term and long-term disability, and the associated costs to the individual, employer and/or society. The study that measured presenteeism through a survey used the World Health Organization's Health and Work Performance Questionnaire to assess performance at work. One study included home production in its costs.
- Shields and Beard (2015) looked at the economic and humanistic burden of gout in studies worldwide. Only three of the thirteen studies examined looked at indirect costs: these looked at work days lost, social days lost, sick leave days, short-term disability costs and days of work disability.
- Alleman et al (2015) looked at the humanistic and economic burden of painful diabetic peripheral neuropathy (a complication of diabetes) in Europe. Non-medical economic burden was reported in two studies, one looking simply at how many people reported

disruption/productivity impacts at work, one providing a monetised value based on absenteeism and presenteeism.

- Blaiss (2010) looked at the direct and indirect costs of allergic rhinitis. They look at direct medical costs (including highlighting what they describe as "hidden" direct costs, based on other medical conditions brought about by the index condition, eg. sinusitis) and indirect costs, covering income lost due to missed work, decreased productivity, missed school time and unpaid caregiver time. They looked at a 2006 US study called Allergies in America which recorded the proportions who had missed work and asked participants to self-rate their productivity. Several employer based studies also found productivity impacts.

Statistics on Food Consumption

We also looked at existing statistics on food consumption in the UK, which could be used in lieu of a control group to compare against the amount paid by individuals with food hypersensitivities. The main source for food spend data is the Office for National Statistics' Living Costs and Food Survey, and some additional potentially useful information is provided in the FSA's Food and You Survey.

ONS Living Costs and Food Survey

The Living Costs and Food Survey is "the most significant survey on household spending in the UK." It includes detailed information on food consumption and nutrition. The latest release covers the period April 2018 to March 2019.

Food and non-alcoholic drink consumption is collected by category: these are included in the table below:

Table 6: Food and non-alcoholic drink categories from the ONS Living Costs and Food Survey

Food type	Specific food item
Carbohydrates	Bread, rice and cereals
Carbohydrates	Pasta products
Carbohydrates	Buns, cakes, biscuits etc.
Carbohydrates	Pastry (savoury)
Meat	
Meat	Beef (fresh, chilled or frozen)
Meat	Pork (fresh, chilled or frozen)

Food type	Specific food item
Meat	Lamb (fresh, chilled or frozen)
Meat	Poultry (fresh, chilled or frozen)
Meat	Bacon and ham
Meat	Other meats and meat preparations
Fish	Fish and fish products
Dairy	Milk
Dairy	Cheese and curd
Dairy	Eggs
Dairy	Other milk products
Fats	Butter
Fats	Margarine, other vegetable fats and peanut butter
Fats	Cooking oils and fats
Fruits	Fresh fruit
Fruits	Other fresh, chilled or frozen fruits
Fruits	Dried fruit and nuts
Fruits	Preserved fruit and fruit based products
Vegetables	Fresh vegetables
Vegetables	Dried vegetables and other preserved and processed vegetables
Vegetables	Potatoes
Vegetables	Other tubers and products of tuber vegetables
Sugary products	Sugar and sugar products
Sugary products	Jams, marmalades
Sugary products	Chocolate
Sugary products	Confectionery products
Sugary products	Edible ices and ice cream
Other food products	-
Drinks	Coffee
Drinks	Tea
Drinks	Cocoa and powdered chocolate
Drinks	Fruit and vegetable juices (inc fruit squash)
Drinks	Mineral or spring waters
Drinks	Soft drinks

Spend on each category is collected by household, and broken down by:

- Place of purchase (large supermarket chains, other outlets, internet expenditure)
- Gross income decile group
- Age of household reference person
- Region

Overall figures for food and non-alcohol drink spend are also broken down by:

- Urban and rural areas
- Economic status, socio-economic class, housing tenure
- Household composition

Cross-referencing is done in some cases: overall figures for food spend by age together with income quintile, by employment status and income together, and by household composition together with income quintile, although this is not broken down by food category.

FSA Food and You Wave 4

The Food and You consumer survey is administered by the FSA and is intended to collect information on "the public's reported behaviours, attitudes and knowledge relating to food safety and food issues." In the latest release of the data (Wave 4), relevant data for this study can be found in chapter 1 (covering shopping, cooking and eating) and chapter 3 (covering eating out). Data that may be of use for this research includes statistics on the prevalence of food reactions (including diagnosed and not), information on where households shop (eg. large supermarket, mini supermarket, independent shops, home delivery), and frequency of eating out (and type, eg. restaurant, fast food, pub).

This data is broken down by age group, country, household size, whether there are children in the household (under 16, under 6), work status, household income status and marital status.

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Appendix 2: Rapid Evidence Assessment Search Protocol

Research Questions

We defined four key research questions to inform our search, based on the aims discussed above. These were as follows:

1. **What are the costs incurred by people living with a food hypersensitivity?**
2. **What are the burdens of living with a food hypersensitivity more generally?**
3. **What research has been done in related areas on price differentials/representative 'baskets of goods' between groups?**
4. **What statistics are available on food consumption patterns and costs among groups?**

For people with FH, Question 1 was focused on food consumption costs and other financial costs (for example, equipment, prescriptions, travel costs, education/ training); question 2 was much broader and could include changes to behaviours or consumption patterns, like shopping and eating out, as well as time spent due to hypersensitivities (for example, time spent reading labels or travelling to appointments), which can be quantified as economic costs. This allows us to pick up studies that have quantified the burden of FHS in monetary terms and studies that identify and measure the burden in a way that could lead to quantification, to understand the burdens in monetary terms. These questions were taken together, and results are presented by food cost and non-food cost.

For question 3 we focused on looking at studies that measured the cost or burden of other chronic conditions or disabilities, summarising the methods they used found here and looking specifically for any findings on price differentials or representative baskets of goods.

For question 4 we looked for information from the UK on general food consumption costs that could be used to compare costs for people with FHS against.

Evidence assessment methodology

We reviewed the following four sources of evidence:

1. Research and literature recommended to us by the FSA team and our expert advisors

2. Relevant literature databases
3. Grey literature
4. Relevant statistics on food consumption patterns

The idea behind first reviewing the recommended research and literature was to provide us with the most relevant background knowledge and to help us formulate our search strategy for the systematic search of the published literature in the next step.

Scope

The scope was defined by the research questions, although we also restricted our search to studies published in 2010 or later (including reviews of earlier studies), in the English language and focused on OECD countries.

Studies focused only on cost of illness were deemed out of scope, as these will be covered by the other projects commissioned by the FSA.

Search strategy

We conducted two database searches. The first was a focused search of the following literature databases: Pubmed, NHS Evidence, HMIC, Embase, Cinahl, Emcare, Medline. The search terms varied across the databases, but included a variation of the following:

- *food hypersensitivity AND burden*
- *food hypersensitivity AND cost*
- *food hypersensitivity (economic or financial or management)*
- *food allergy AND burden*
- *food allergy AND cost*
- *food allergy (economic or financial or management)*
- *coeliac disease AND burden*
- *coeliac disease AND cost*
- *food allergy (economic or financial or management)*
- *food intolerance and burden*
- *food intolerance and cost*
- *food intolerance (economic or financial or management)*

This search was focused on research questions 1 and 2 and yielded approximately 2,000 results. These were then reduced by de-duplication and looking for items that answered aspects of the research questions. After an initial screen by library services we were provided with 169 abstracts.

We then conducted a second, broader search in Google Scholar for the first three research questions. This focused on evidence on cost or burden for food hypersensitivities but also on evidence on cost or burden for chronic conditions, chronic disease and disabilities. After an initial screen by library services this search yielded 265 abstracts (42 of these were duplicates of abstracts retrieved in the first search).

Additionally, we searched grey literature for relevant unpublished articles. This included grey literature databases, such as Open Grey, but also websites of relevant charities, such as Anaphylaxis Campaign, Allergy UK or Coeliac UK. Google searches were also conducted, focusing on original unpublished research in the area of food hypersensitivities. Research question 4, searching for statistics on food consumption, was primarily conducted through specific Google searches.

The whole literature searching was conducted between August and September 2020.

Study selection

Studies included in the review were selected based on the following inclusion and exclusion criteria:

Inclusion criteria

- References the costs of living with a food hypersensitivity (beyond the cost of illness) OR
- References the impact of a food hypersensitivity on a day-to-day life OR
- References the cost, price differentials or ‘based of goods’ for food hypersensitivity or a different chronic condition/disability OR
- Contains statistics on general food consumption patterns and costs

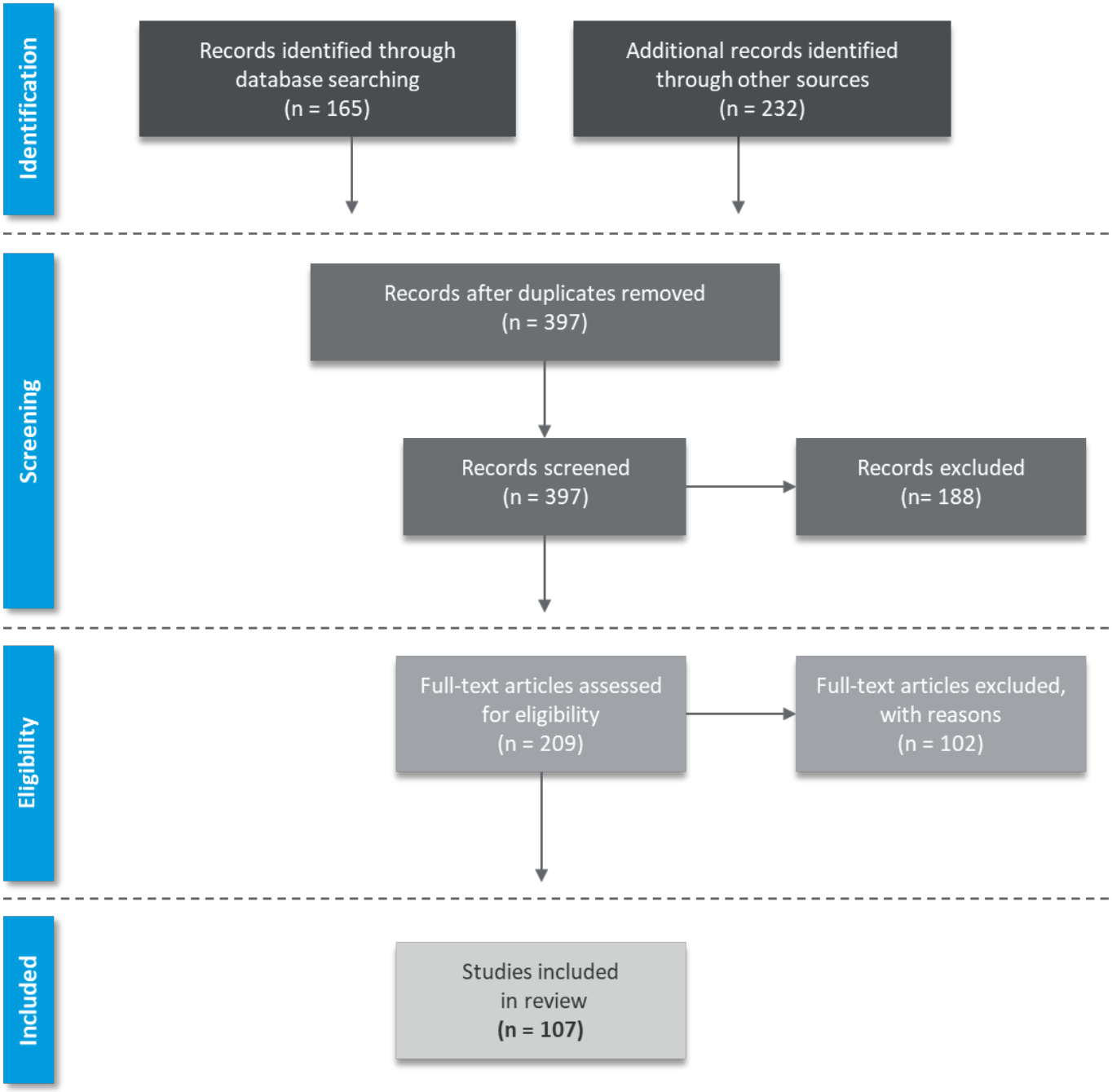
Exclusion criteria

- Not in English language
- Published/Released prior to 2010
- Conducted in a non-OECD country
- Does not meet any of the inclusion criteria above

Initially, we applied the inclusion/exclusion criteria to the abstracts (where available) of the retrieved studies. At this stage, studies that clearly did not meet any of the inclusion criteria and met at least one of the exclusion criteria, were excluded. Studies that met the inclusion criteria, or those where a decision could not be made based on the abstract alone, were selected for the next stage, which involved full text review of the retrieved studies. At this stage, the inclusion and exclusion criteria were applied to the full texts and the results are summarised in Figure 1 below.

The total number of included studies was 107. References are included in the Annex, and detail on the papers screened and included at each stage is provided in the diagram below.

Figure 1: Study Selection



In the first stage there were 165 records identified through database searching and 232 additional records identified through other sources. Next, duplicates were removed leaving 397 records, which were further screened and an additional 188 were excluded. The eligibility of remaining records was checked, whereby 209 full-text articles were assessed and 102 were excluded with reasons. Overall 107 studies were included in review.

Data extraction and synthesis

During the full text review of the retrieved studies, once it was decided that a study met the inclusion criteria, we looked for the following information, which we extracted to later summarise for this report:

- Study information (title, authors, year of publication/release)
- Country of origin
- Aims
- Methods

Appendix 3: Interview Topic Guide

RSM have been commissioned by the FSA to look at the financial cost of living with a food hypersensitivity. We are considering both food costs and non-food costs, among them direct costs like supplements and medication; indirect costs like travel and lost income, and non-financial costs like time spent reading labels. This will feed into a wider piece of work they are doing on the cost of illness due to FH and the impact on quality of life.

The aim of this interview is to understand the costs you face as an FH sufferer/parent of a child with FH and to test some of the questions that we will be using in our survey that will go out to a wider group of FH sufferers[2]/parents of children with FH. Please let us know if there are any questions you think don't make sense, or any questions you think we should be asking, but haven't.

Note that all will be anonymised & that respondents only need answer questions they're comfortable with.

Background information

1. Which of the following groups do you fall into?

- Food hypersensitivity sufferer
- Parent of a child with a food hypersensitivity

[2] We acknowledge that the correct term to use is 'individuals living with FHS' rather than 'sufferers'. However, this topic guide was developed before guidance on the correct term was finalised. We aim to use the correct term in any future work.

- Both

2. Which of the following age groups do you/your child fall into?

- 0-4
- 5-9
- 10-14
- 15-19
- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70-79
- 80+

3. What is your gender?

- Male
- Female
- I prefer to identify in another way
- Prefer not to say

4. What is your ethnic group?

A – White

- White: UK (English/Welsh/ Scottish Northern Irish, British)
- White: Irish
- Any other White background:

B – Mixed/ multiple ethnic groups

- Mixed/multiple ethnic groups: White and Black Caribbean
- Mixed/multiple ethnic groups: White and Black African
- Mixed/multiple ethnic groups: White and Asian
- Any other Mixed/multiple ethnic group background:

C – Asian/Asian British

- Indian
- Pakistani
- Bangladeshi
- Chinese
- Any other Asian background

D – Black /African /Caribbean/ Black British

- African
- Caribbean
- Another Black/African/Caribbean background

E - Other ethnic group

- Arab
- Any other ethnic group

F – prefer not to say

5. Which of the following best describes where you live?

- City
- Town
- Rural

Information on your food hypersensitivity

6. How would you classify your/your child's food hypersensitivity?

- Food intolerance
- Food allergy
- coeliac disease

7. What causes the hypersensitivity?

- Celery
- Cereals containing gluten

- Crustaceans
- Eggs
- Fish
- Lupin
- Milk
- Molluscs
- Mustard
- Nuts
- Peanuts
- Sesame seeds
- Soya
- Sulphur dioxide (sulphites)
- Other (please specify)

8. How long have you/has your child suffered from this food hypersensitivity?

- 0-6 months
- 6-12 months
- Less than 2 years
- 2-5 years
- Over 5 years

9. Has this food hypersensitivity been medically diagnosed?

- Yes
- No

10. Do you/your child have any dietary preferences that affect your/your child's food consumption?

- No
- Yes (please specify)

11. Are there any other health issues that impact upon your/your child's consumption habits?

- No
- Yes (please specify)

Non-food costs

12. Do you take (or keep a stock of) any nutritional supplements as a consequence of your/your child's food hypersensitivity?

- Yes
- No

13. If yes, what types of nutritional supplement do you/your child take?

14. If yes, approximately how much does this cost you per month?

15. Do you take (or keep a stock of) any over-the-counter medication as a consequence of your/your child's food hypersensitivity?

- Yes
- No

16. If yes, what over-the-counter medication do you/your child take related to your food hypersensitivity?

17. If yes, approximately how much does this cost you per month?

18. Do you require any specialist equipment to manage your/your child's food hypersensitivity?

[include list based on what comes out of the interviews]

19. If yes, approximately how much does this cost you per month?

20. How long does it take you to travel to medical appointments related to your/your child's food hypersensitivity? [banded options based on what comes out of the interviews]

21. How many times do you have these appointments annually?

22. What changes, if any, have you had to make to your working pattern because of your food hypersensitivity (ie working reduced hours, working from home)? [Open text]

23. Do you ever have to pay for additional childcare due to managing your/your child's food hypersensitivity?

- Yes
- No

24. If yes, how much would you estimate this costs you per year?

25. Have you in the past or do you currently take part in any training or education related to your/your child's food hypersensitivity?

- Yes, I undertake training/education regularly
- Yes, I undertake training/education on an ad hoc basis
- No

26. How much do you estimate that this costs you per year?

27. Are you a member of a food hypersensitivity-related charity?

- Yes
- No

28. If yes, how much does this cost you per year?

29. Do you see a councillor/psychologist to help you manage the impact of your condition?

- Yes
- No

30. How much do you estimate that this costs you per year?

31. What, if any, other comments do you have on the non-food-related costs or burdens you experience due to your food hypersensitivity? [Open Text]

Food

Shopping

32. Where do you normally shop for food?

- In large supermarket (for example, Tesco, Sainsbury's, Waitrose etc)
- In local supermarkets (for example, Tesco Metro, Sainsbury's local, Co-op, etc)
- In independent stores
- In specialist stores
- On the internet – large supermarkets
- On the internet – specialist stores

33. How much time do you spend food shopping per week? [to develop banded options based on interviews]

34. How much time do you spend planning your food shop per week? [to develop banded options based on interviews]

35. To what extent would you agree or disagree with the following statements: [strongly agree to strongly disagree

a. My choice of shop is influenced by my/my child's food hypersensitivity
b. My shopping takes longer than it would if I/my child didn't have a food hypersensitivity
c. I need to spend longer planning than someone without a food hypersensitivity

36. Do you have to travel further to do you food shopping because of your/your child's food hypersensitivity?

- No
- Yes (please specify how much additional time this takes you)

37. What items, if any, create a difference between the cost of your food shop and that of someone without a food hypersensitivity? [Open Text]

38. Do you get any food on prescription?

- Yes (please specify)
- No

39. If yes, how much does this cost you?

40. What, if any, other comments do you have regarding the impact of your/your child's food hypersensitivity on your shopping habits? [Open Text]

Eating out – restaurants

41. How frequently do you eat out at a restaurant, café or pub?

- More than once a week
- Once a week
- 2-3 times a month
- Once a month
- Less than once a month

42. To what extent would you agree or disagree with the following statements: [strongly agree to strongly disagree]

a. My/my child's food hypersensitivity impacts:

- Where I go out to eat
- How often I go out to eat
- What foods I choose when I am eating out

43. Please explain your ratings above.

44. How much more or less would you say the cost of your meal compares to those without a food hypersensitivity? Please think about how much more or less your bill is on an average meal out, compared to those without a food hypersensitivity.

45. What other comments, if any, do you have about the impact of your food hypersensitivity on eating out?

Final questions

46. Do you have anything else you would like to share with us about the burden of your food hypersensitivity and the costs associated with it?

Appendix 4: FHS Survey and Food Diary

Food Hypersensitivity: What does it cost you?

1. Introduction

RSM have been commissioned by the Food Standards Agency (FSA) to calculate the financial cost of living with a food hypersensitivity (food intolerance, food allergy or coeliac disease). In this survey, we are seeking to understand both food costs and non-food costs, among them direct costs like supplements and medication, indirect costs like travel and lost income, and non-financial costs like time spent reading labels.

If you would prefer, you can fill out the survey in Welsh, Smart Survey in Welsh
Os byddai'n well gennych chi lenwi'r arolwg yn Gymraeg, dilynwch y ddolen hon

More information on this project and an accompanying project on the quality of life impacts is available on the Consumer research on living with a food hypersensitivity.

The survey should take no longer than 20-30 minutes to complete, and is completely voluntary. In line with GDPR, all responses will be kept anonymous and confidential. No identifiable data will be collected. For questions with text responses, please make sure that you do not provide any personally identifiable information (information that could be used to identify you or your household.)

In accordance with new data protection laws and RSM data protection protocols, information we obtain will be stored on password protected computers. The data will be kept for a maximum of 30 days after the completion of this project (scheduled to finish in June 2021) and will then be destroyed by RSM. The collected data will be used to produce a statistical report to be published on the FSA website. We may use quotes from the survey in this report to support our findings and we will ensure they are not used in any way that might identify you. No other disaggregated (i.e. individual) information will be included.

The survey is designed to explore your experiences of having a food hypersensitivity, and it is possible that you might recollect a stressful or challenging situation. There are national support groups that can help with questions about your condition, including Allergy UK (www.allergyuk.org), the Anaphylaxis Campaign (www.anaphylaxis.org) and Coeliac UK (coeliac.org.uk)

If you have any questions about this research, please contact Katherine.Troeller@rsmuk.com.

55. Do you have to travel further to do your food shopping because of your/your household's food hypersensitivities?

☐Yes

☐No

56. If yes, how much time does this add to your trip per week?

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

57. Do you need to use any special or additional equipment for cooking and preparing food?

☐Yes (please specify:

☐No

Details (please ensure that you do not include any information that could identify you):
Click or tap here to enter text.

58. How has Covid-19 changed your shopping habits, if at all? (Please ensure that you do not include any information that could identify you):

Click or tap here to enter text.

59. What, if any, other comments do you have regarding the impact of food hypersensitivities on your shopping & cooking habits? (Please ensure that you do not include any information that could identify you):

Click or tap here to enter text.

12. Eating out and takeaways

The following questions are about the impact of food hypersensitivities on eating out and takeaways. Please think about your habits prior to the Covid-19 pandemic when answering these questions.

60. For the purposes of this section of questions, please answer for before the Covid-19 pandemic. How frequently does your household, or any member of your household, eat out (for example, at a restaurant, cafe or pub) or get a takeaway?

☐At least once a day

☐5 to 6 times a week

☐3 to 4 times a week

☐Once or twice a week

☐Once a fortnight

☐Once a month

☐Less than once a month

☐Never

61. To what extent would you agree with the following statements?

Statements	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
We eat out or get a takeaway less often because of my/the household's food hypersensitivities	☐	☐	☐	☐	☐
The food hypersensitivities influence where we	☐	☐	☐	☐	☐

Statements	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
eat out or get a takeaway from The food hypersensitivities influence what foods we choose when we eat out/get a takeaway	☐	☐	☐	☐	☐

62. How much does your household typically spend on eating out/takeaways per month?

Monthly spend: Click or tap here to enter text.

Total spend:Click or tap here to enter text.

63. On average, how would you say the price of your meal compares to those without a food hypersensitivity when you eat out?

☐Much less expensive

☐Less expensive

☐The same

☐More expensive

☐Much more expensive

64. How much extra time do you have to spend on average per month planning and preparing for eating out and getting takeaways, because of the food hypersensitivities? (Enter 0 if no extra time)

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

65. How much extra time do you have to spend on average per month planning and preparing for visiting/hosting friends and family, because of the food hypersensitivities? (Enter 0 if no extra time)

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

66. Do you have any additional thoughts on how food hypersensitivity impacts your eating out/takeaway habits? (Please ensure that you do not include any information that could identify you):
Click or tap here to enter text.

67. How has Covid-19 changed your eating out & takeaway habits? (Please ensure that you do not include any information that could identify you):
Click or tap here to enter text.

13. Impact on work/school

The following questions are about the impact of your/your household's food hypersensitivities on work, school and leisure time

68. What is your/your household's gross household income per year?

☐ £0 to £11,000

☐£11,001 to £17,000

☐£17,001 to £22,000

☐£22,001 to £29,000

☐£29,001 to £35,000

☐£35,001 to £42,000

☐£42,001 to £51,000

☐£51,001 to £65,000

☐£65,001 to £89,000

☐£89,001 +

☐I would not like to disclose

69. What changes, if any, have you (or another adult in your household) had to make to your working patterns because of food hypersensitivities? (Please select all that apply)

☐None

☐Switched to flexible working

☐Changed jobs (please give brief detail below

☐Now work from home

☐Reduction in working hours – please specify below

☐Stopped working completely

Comments (please ensure that you do not include any information that could identify you): Click or tap here to enter text.

70. How many days of absence from paid work have you (or another adult in your household) had in the past year due to your household's food hypersensitivities (including your own, and looking after children with food hypersensitivities)? (Enter 0 if no days)

Days per year: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

71. How many unpaid days have you (or another adult in your household) lost due to your household's food hypersensitivities? (including your own, and looking after

children with food hypersensitivities) Consider days of absence from education, training or voluntary work and lost leisure, caring or housework time. Enter 0 if no time.

Days per year: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

14. Impact on work/school (children)

72. How many days of absence from school has your child (or all your children with food hypersensitivities in total) had in the past year due to food hypersensitivities? (Enter 0 if none)

Days per year: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

73. Do you ever have to pay for additional childcare or domestic help due to food hypersensitivities? If yes, please enter the annual cost.

☐Yes

☐No

Annual cost: Click or tap here to enter text.

74. Are there any other out of pocket costs for your children due to the food hypersensitivity (e.g. private schooling/nurseries)?

☐Yes (please specify:

☐No

Details (please ensure that you do not include any information that could identify you): Click or tap here to enter text.

15. Other costs

This section looks at any other costs or burdens you may have incurred due to the food hypersensitivity

75. How much does your household have to pay, per month, for nutritional supplements and/or over the counter medication as a consequence of your/the household's food hypersensitivities? Please enter 0 if no cost.Do not include food on prescription, this is included as a later question.

Cost per month: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

76. How much does your household have to pay, per month, for prescription medication (e.g. adrenaline auto-injectors, anti-histamines, corticosteroids) as a consequence of your/the household's food hypersensitivities? (Please enter 0 if no cost)

Cost per month: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

77. Does your household currently get any food on prescription?

☐Yes (please specify:

☐No

Details and cost (please specify, ensuring that you do not include any information that could identify you):

Click or tap here to enter text.

78. How much does this cost per month? Please enter 0 if no cost.

Cost per month: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

79. Do you require any specialist or additional equipment to manage your/your household's food hypersensitivities? (Excluding kitchenware, so for example medical bags, inhalers, medical alert bracelets etc.)

☐Yes (please specify:

☐No

Details (please ensure that you do not include any information that could identify you):
Click or tap here to enter text.

80. How much does this cost your household per year?

Annual cost: £Click or tap here to enter text.

Total: £ Click or tap here to enter text.

81. How frequently do household members, including yourself have medical appointments for food hypersensitivities? (for example, allergy consultant, GP, therapy/counselling, nurse, dietitian/nutritionist, gastroenterologist etc.)

Number of appointments per year: Click or tap here to enter text.

82. Approximately how much time does an average appointment take, including travel time?

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

83. Do you pay for any private healthcare as a result of your/your household's food hypersensitivities (i.e. that you wouldn't otherwise have taken out)?

☐Yes

☐No

84. If yes, how much does this cost your household per year?

Annual cost: £ Click or tap here to enter text.

Total: £ Click or tap here to enter text.

85. Approximately how much time per month do you/your household spend on research, training or education related to food hypersensitivities? (e.g. reading fora or charity websites, watching videos etc.) Please do not include time spent reading food labels - enter 0 if no time spent.

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

86. Approximately how much time per month do you/your household have to spend educating/informing other people about food hypersensitivities? Enter 0 if no time spent.

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

87. How does the food hypersensitivity impact on holidays and trips away? (Please ensure that you do not include any information that could identify you):

Click or tap here to enter text.

88. Were there any significant time or financial costs when the/one of the food hypersensitivities was first diagnosed (that haven't continued to the present)? (Please ensure that you do not include any information that could identify you):

Click or tap here to enter text.

89. Do you have anything else you would like to share with us about the burden of your/your household's food hypersensitivities and the costs associated with it? (Please ensure that you do not include any information that could identify you):

Click or tap here to enter text.

16. Food diary

This page is a food diary where we ask you about the money spent over the past week

90. Please enter, in whole numbers only, how much your household has spent over the past week against the items below. Please include spend in shops and supermarkets, but not cafes, pubs, restaurants or takeaways.

This stage is not mandatory for the overall survey, so you can skip this page if you wish.

Type in 0 if item not bought.

Bread £Click or tap here to enter text.

Rice £Click or tap here to enter text.

Past and pasta products £Click or tap here to enter text.

Buns, cake, biscuits etc., plus savoury pastry £Click or tap here to enter text.

Other breads and cereals (including breakfast cereals) £Click or tap here to enter text.

Meat and meat products £Click or tap here to enter text.

Fish and fish products £Click or tap here to enter text.

Milk £Click or tap here to enter text.

Cheese and curd £Click or tap here to enter text.

Eggs £Click or tap here to enter text.

Butter, margarine, other vegetable fats £Click or tap here to enter text.

Other milk products; for example yoghurts £Click or tap here to enter text.

Dairy alternatives; for example oat milk £Click or tap here to enter text.

Peanut butter £Click or tap here to enter text.

Cooking oils and fats £Click or tap here to enter text.

Fruit and fruit-based products £Click or tap here to enter text.

Nuts £Click or tap here to enter text.

Vegetables £Click or tap here to enter text.

Potatoes and other tubers £Click or tap here to enter text.
Sugar, jams, marmalades, chocolate, confectionary, and ice cream £Click or tap here to enter text.
Other food products for example sauces condiments, soups, salt, herbs and spices £ Click or tap here to enter text.
Coffee, tea, cocoa and powdered chocolate £ Click or tap here to enter text.
Juice £Click or tap here to enter text.
Water £Click or tap here to enter text.
Soft drinks £Click or tap here to enter text.
Alcohol £Click or tap here to enter text.
Total: £Click or tap here to enter text.

Comments (please ensure that you do not include any information that could identify you):
Click or tap here to enter text.

91. What did you base your response above on?

☐Calculating expenditure based on receipts and records

☐Estimated past week's expenditure

92. How much has your household spent over the past week on takeaways and eating out?

Takeaways £Click or tap here to enter text.
Eating out £Click or tap here to enter text.
Total: £Click or tap here to enter text.

Appendix 5: Control Group Survey and Food Diary

Food Hypersensitivity: a comparator survey amongst UK Grocery Shoppers

Introduction

The Food Standards Agency (FSA) has commissioned a study of UK grocery shoppers to understand the financial cost of living with a food hypersensitivity (food intolerance, food allergy or coeliac disease). As part of this study, we want to gather views of respondents who DO

NOT suffer from food hypersensitivities to understand how to they compare to those of sufferers. Please note that If you DO suffer from a food hypersensitivity, you will not be able to take part in this survey. A separate survey is being conducted for people with food hypersensitivities.

The current survey is only for respondents who a) DO NOT suffer from food intolerances and b) have responsibility for grocery shopping in their household.

This survey is being administered by BMG Research, an independent research agency. It **takes on average 15 minutes to complete.**

All responses will be treated confidentially, and all results will be anonymised. BMG Research abides by the Market Research Society Code of Conduct and data protection laws at all times. If you would like to check that BMG is a genuine market research agency, you can do so by visiting the MRS website.

The collected data will be used to produce a statistical report to be published on the FSA website. Further **details about what we will do with the information collected can be found in** our privacy notice**.**

By selecting the 'next' button, you agree to participate in the survey and for BMG to process the information collected.

Select the button below to begin the survey.

Background information

A. Which country do you live in?

☐ England

☐ Scotland (screen out)

☐ Wales

☐ Northern Ireland

☐ Outside of the UK (screen out)

B. This survey requires respondents to give their full postcode. Are you happy to provide this?

This information will only be used for statistical purposes to analyse the results by specific areas, such as Local Authority, Constituency and Government areas. Asking for your postcode saves you time and helps us to report more accurate information. All answers will be treated entirely anonymously and postcode information will not be used for any other purpose.

Please select one answer only

☐ Yes

☐ No (screen out)

C. Could you please provide your full UK postcode?
Please ensure to include a space where applicable, for example AB1 2CD.

Please type in your response

Click or tap here to enter text.

☐ Refused (screen out)

[Ask if question 6 wales]

6A. Do you prefer to complete the survey in Welsh or are you happy to carry on in English?
I would like to complete the survey in Welsh [Route to Welsh questionnaire]

I am happy to carry on in English [Proceed to question 4]

4. Do you have a food hypersensitivity? (This could be an intolerance to certain food(s), an allergy to certain food(s) or coeliac disease.) *

☐ Yes (screen out)

☐ No but other members of my household do (screen out)

☐ No and nobody in my household does (screen out)

4B. Are you responsible for grocery shopping in your household?

☐ Yes, I am the main person responsible for grocery shopping in my household

☐ Yes, I share equal responsibility for grocery shopping with other people in my household

☐ No, I am not responsible for grocery shopping in my household (screen out)

7. Which of the following age groups do you fall into? *

☐ Under 16 (screen out)

☐16 to 17 (Screen out)

☐18 to 19

☐20 to 29

☐30 to 39

☐40 to 49

☐50 to 59

☐60 to 69

☐70 to 79

☐80+

For the purpose of this survey, your *household* refers to people you live with **and** with whom you share food shopping

2. How many adults (18 or over) live in your household? (See text above for who 'your household' refers to.) *

☐1

☐2

☐3

☐4

3. How many children (under 18) live in your household? *

☐0

☐1

☐2

☐3

☐4

22. Do you have any of the following dietary preferences or restrictions?

Please select all that apply

☐None

☐Pescatarian

☐Vegetarian

☐Vegan

☐Halal diet

☐Kosher diet

☐Other please specify Click or tap here to enter text.

Shopping

The following questions are about food shopping for the household. Please think about your habits **prior to the Covid-19 pandemic** when answering these questions.

49. For the purposes of this section of questions, please answer for before the Covid-19 pandemic. Where do you (your household) normally shop for food?

☐Large supermarket chains

☐Other outlets (for example, specialist or independent stores)

☐Online

50. Do you regularly do top-up/additional shops to buy food outside of your main weekly shop? Please select as many as apply.

☐I get what I need in my main shop

☐I buy additional food from other supermarkets

☐I buy additional food from specialist shops

☐I order additional food online, from a supermarket chain

☐I order additional food online, from specialist outlets

51. How much does your household spend on food & non-alcoholic drinks per week? Please include spend in shops and supermarkets, but not cafes, pubs, restaurants or takeaways. *

If you are unable to provide an exact figure, please provide your best estimate.

Type in Weekly spend: £

Total: Click or tap here to enter text.

52. How much would you estimate you spend specifically on allergen-free product equivalents for example, gluten-free bread? (Enter 0 if not applicable or if you substitute with other everyday products.) Please include spend in shops and supermarkets, but not cafes,

pubs, restaurants or takeaways.

Weekly spend total: £Click or tap here to enter text.

53. How much time does your household spend food shopping per week? If you are unable to recall the exact timings, please provide your best estimate. Please type in your answer.

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

54. On top of the time spent shopping, how much time do you estimate that you spend planning your food shop and checking/reading labels per week?

Hours Click or tap here to enter text.

Minutes Click or tap here to enter text.

Total Click or tap here to enter text.

58. How has Covid-19 changed your shopping habits, if at all?
Please type in your response

Click or tap here to enter text.

60. For the purposes of this section of questions, please answer for before the Covid-19 pandemic. How frequently does your household, or any member of your household, eat out (for example, at a restaurant, cafe or pub) or get a takeaway?
☐At least once a day

☐5 to 6 times a week

☐3 to 4 times a week

☐Once or twice a week

☐Once a fortnight

☐Once a month

☐Less than once a month

☐Never

62. How much does your household typically spend on eating out/takeaways per month?

Monthly spend: Click or tap here to enter text.

Total spend:Click or tap here to enter text.

67. How has Covid-19 changed your eating out & takeaway habits? (Please ensure that you do not include any information that could identify you):
Please type in your response

Click or tap here to enter text.

Food diary

This page is a **food diary** where we ask you about the money spent over the past week

90. Please enter, in whole numbers only (£), how much your household has spent over the past week against the items below. Please include spend in shops and supermarkets, but not cafes, pubs, restaurants or takeaways.
If you are unable to provide an exact figure, please provide your best estimate.
Type in 0 if item not bought.

Bread £Click or tap here to enter text.

Rice £Click or tap here to enter text.

Past and pasta products £Click or tap here to enter text.

Buns, cake, biscuits etc., plus savoury pastry £Click or tap here to enter text.

Other breads and cereals (including breakfast cereals) £Click or tap here to enter text.

Meat and meat products £Click or tap here to enter text.

Fish and fish products £Click or tap here to enter text.

Milk £Click or tap here to enter text.

Cheese and curd £Click or tap here to enter text.

Eggs £Click or tap here to enter text.

Butter, margarine, other vegetable fats £Click or tap here to enter text.

Other milk products; for example yoghurts £Click or tap here to enter text.

Dairy alternatives; for example oat milk £Click or tap here to enter text.

Peanut butter £Click or tap here to enter text.

Cooking oils and fats £Click or tap here to enter text.

Fruit and fruit-based products £Click or tap here to enter text.

Nuts £Click or tap here to enter text.

Vegetables £Click or tap here to enter text.

Potatoes and other tubers £Click or tap here to enter text.

Sugar, jams, marmalades, chocolate, confectionary, and ice cream £Click or tap here to enter text.

Other food products for example sauces condiments, soups, salt, herbs and spices £ Click or tap here to enter text.

Coffee, tea, cocoa and powdered chocolate £ Click or tap here to enter text.

Juice £Click or tap here to enter text.

Water £Click or tap here to enter text.

Soft drinks £Click or tap here to enter text.

Alcohol £Click or tap here to enter text.

Total: £Click or tap here to enter text.

91. What did you base your response to the previous question on?
Please select one answer only

☐Calculating expenditure based on receipts and records

☐Estimated past week's expenditure

92. How much has your household spent over the past week on takeaways and eating out?

Takeaways £Click or tap here to enter text.

Eating out £Click or tap here to enter text.

Total: £Click or tap here to enter text.

Demographic questions

[SHOW TEXT ON SEPARATE SCREEN TO ALL]

We now have a few final questions about you. We recognise that you might consider some of these questions to be personal or sensitive, in which case you are free not to answer them. The information you provide will be used for the sole purpose of ensuring we are getting opinions from a cross-section of society.

68. What is your/your household's gross household income per year?
Please select one answer only

☐ £0 to £11,000

☐£11,001 to £17,000

☐£17,001 to £22,000

☐£22,001 to £29,000

☐£29,001 to £35,000

☐£35,001 to £42,000

☐£42,001 to £51,000

☐£51,001 to £65,000

☐£65,001 to £89,000

☐£89,001 +

☐I would not like to disclose

8. What is your gender? *
Please select one answer only

☐Male

☐Female

☐I prefer to identify in another way

☐I prefer not to say

9. What is your ethnic group? *

Please select one answer only

A White

☐UK (English/ Welsh/ Scottish/Northern Irish/British)

☐Irish

☐Any other White background

B- Mixed/Multiple Ethnic Groups

☐White and Black Caribbean

☐White and Black African

☐White and Asian

☐Any other mixed background

C – Asian or Asian British

☐Indian

☐Pakistan

☐Bangladeshi

☐Chinese

☐Any other Asian background

D – Black/African/Caribbean/Black British

☐Caribbean

☐African

☐Any other Black/African/Caribbean/Black British

E – Other Ethnic Group

☐Arab

F – Prefer not to say

☐I do not wish my ethnic origin

G – Other

☐Other

If other, please specify (please ensure you do not include any information that could identify you):

Click or tap here to enter text.

10. What is your highest level of education? *
Please select one answer only

☐GCSE/O Level or equivalent

☐A level or equivalent

☐Higher education certificate/BTEC or equivalent

☐Degree or equivalent

☐Post graduate degree or equivalent

☐No qualifications

☐Prefer not to say

☐Other (please specify, ensuring that you do not include any information that could identify you)

11. Which of the following best describes you? *

Please select one answer only

☐ In full-time employment

☐In part-time employment

☐Self-employed

☐In full or part-time education or training

☐Not working or in education or training

☐Retired

☐Prefer not to say

☐Other (please specify, ensuring that you do not include any information that could identify you)

Click or tap here to enter text.

Thank you very much for your time.

Appendix 6: Statistical Methods

Direct food costs

Data

There are three food consumption costs asked for in the survey which was used for analysis. They are:

- Food Diary Costs – weekly spend on food and beverage consumption broken down to a representative basket of goods
- Weekly Groceries Spend – weekly spend on any food and non-alcoholic beverages bought from a store/supermarket (excluded eating out/takeaway spend)
- Monthly Eating Out / Takeaway Spend – monthly spend on food and beverages bought from restaurants, cafes etc. This cost was converted into a weekly spend for the primary analysis to be consistent with the other two costs.

There were a total of 1225 observations for adults with FHS and 1530 observations for the adults without FHS. However, as it was not compulsory to complete the food diary costs section, only about 45.7% of respondents from group with FHS completed the food diary costs section, but 100% of respondents in the comparison group completed the food diary costs section.

As the aim is to compare each FHS group (FIO, CD, and FA) with the non-FHS group, three datasets were created for the analysis:

- Dataset A: consisting of FIO versus non-FHS
- Dataset B: consisting of CD versus non-FHS
- Dataset C: consisting of FA versus non-FHS

Also, there was a difference in total number of responses across the three outcome variables. This difference stemmed from difference in number of outliers in each outcome variable (1 for weekly food diary costs, 4 outliers for weekly groceries costs, and 1 for monthly eating out / takeaway costs) and non-responses for food diary costs (116 non-responses for FIO, 319 for CD, and 214 for FA). Thus, these three datasets were created for each outcome variable. This meant that there were 9 datasets in total, as listed below:

- Weekly Food Diary Costs
    - Dataset 1: consisting of FIO and non-FHS (1648 observations)
    - Dataset 2: consisting of CD and non-FHS (1862 observations)
    - Dataset 3: consisting of FA and non-FHS (1656 observations)
- Weekly Groceries Costs
    - Dataset 4: consisting of FIO and non-FHS (1764 observations)
    - Dataset 5: consisting of CD and non-FHS (2178 observations)
    - Dataset 6: consisting of FA and non-FHS (1869 observations)
- Monthly Eating Out / Takeaway Costs
    - Dataset 7: consisting of FIO and non-FHS (1764 observations)
    - Dataset 8: consisting of CD and non-FHS (2181 observations)
    - Dataset 9: consisting of FA and non-FHS (1869 observations)

The methods listed below were implemented individually for each outcome and dataset. For example, propensity score matching, multiple imputation combined with missing indicator, and multivariate regression were performed on Dataset 1. This process was then repeated for the rest of the 8 datasets.

Missing data

There were 498/2755 missing data in total for the Household Income variable in the combined FHS Household Group Survey and the Control Household Group Survey. There were also missing data for a few other demographic variables such as education, gender, region, geography, age, and ethnicity; however, those constitute only 0.08%-3.60% of missing data. The specific level of missingness for each variable can be found in the table below.

Table 1: Level of missing data for each variable from both FHS (n = 1,225) and non-FHS household (n = 1,530) group survey conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

Variables	Level of missingness: FHS Household Group Survey	Level of missingness: Control Household Group Survey
Household Income	368/1225 (30.0%)	130/1530 (8.5%)
Gender	16/1225 (1.3%)	3/1530 (0.2%)
Ethnicity	11/1225 (0.9%)	5/1530 (0.3%)
Education	44/1225 (3.6%)	14/1530 (0.9%)
Geography	1/1225 (0.08%)	None
Age	9/1225 (0.7%)	None

The following paragraphs explain how the missing data was dealt with and why an extended Multiple Imputation (MI) method was chosen.

Jakobsen et al (2017) [3] sets out guidelines for situations when MI can be used for handling missing data in randomised clinical trials. Similar considerations apply in non-randomised studies such as the current study. Adopting this framework, we rejected the Missing Completely at Random (MCAR)[4] assumption because exploratory analysis showed that missingness was associated with observed variables. The 'mcar_test' function in R based on Little's (1988)[5] test statistic was used to assess if data is MCAR. Test output showed a low p-value ($p < 0.001$) and high Chi-squared statistic (55.7), which provided indication that the data is not MCAR.

The MAR and MNAR conditions cannot be distinguished based on the observed data because by definition the missing data are unknown and it can therefore not be assessed if the observed data can predict the unknown data (Jakobsen et al, 2017). We hypothesised that covariates such as household income and the outcome measures could be MNAR. When there is a relationship between the propensity of a variable to be missing and its values, the data are said to be Missing Not at Random (MNAR)[6]. Standard multiple imputation (MI) methods require the missing data mechanism to be MCAR or Missing at Random (MAR)[7] and may fail when the data is MNAR.

[3] Jakobsen, J.C., Gluud, C., Wetterslev, J. et al. When and how should multiple imputation be used for handling missing data in randomised clinical trials – a practical guide with flowcharts. BMC Med Res Methodol 17, 162 (2017). https://doi.org/10.1186/s12874-017-0442-1

[4] MCAR means that the probability of values being missing is similar across all cases

[5] Little, R.J.A. (1988) A Test of Missing Completely at Random for Multivariate Data with Missing Values. Journal of the American Statistical Association, 83, 1198-1202. http://dx.doi.org/10.1080/01621459.1988.10478722

[6] MNAR means that the probability of values being missing differs for reasons that are known to the researchers

[7] MAR is broader than MCAR and means that the probability of values being missing is similar only within groups that are defined by observed data

Thus, an extended MI model was chosen for this data. Based on Choi, Dekkers, and le Cessie (2018)[8], a multiple imputation combined with missing indicator method was used that has been recommended for dealing with missing data that are MNAR. Firstly, MI was used to impute the missing covariates using the chained equations (MICE) procedure. Then, variables representing the missing data (with "1" indicating missing data and "0" without missing data) was created for each covariate with missing data and added to the propensity score model. This approach has been shown to reduce bias in MNAR scenarios (Sperrin and Martin, 2020)[9].

The extended MI method was used to generate 5 imputed datasets with all relevant outcomes, and prognostic and confounding variables included in the imputation models. These variables are:

- Relevant outcome – either Food Diary Costs, Weekly Groceries Costs, or Eating Out / Takeaway Spend
- Type of FHS – whether the respondent is a part of CD, FA, FIO, or the non-FHS group
- Control variables such as:
    - Household size
    - Household income
    - Region
    - Gender
    - Education
    - Age
    - Ethnicity
    - Geography
    - Place of shopping (ie large supermarket / online / specialist shops) – only for Food Diary Costs and Weekly Groceries Costs
    - Frequency of eating out – only for Eating Out / Takeaway Spend

[8] Choi, J., Dekkers, O. M., & le Cessie, S. (2019). A comparison of different methods to handle missing data in the context of propensity score analysis. European journal of epidemiology, 34(1), 23–36. https://doi.org/10.1007/s10654-018-0447-z

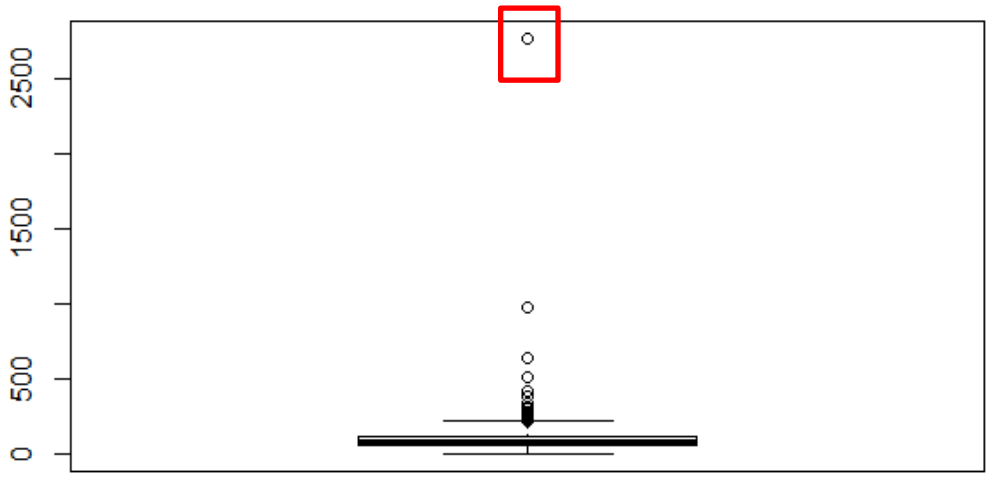
[9] Sperrin, M., Martin, G.P. Multiple imputation with missing indicators as proxies for unmeasured variables: simulation study. BMC Med Res Methodol 20, 185 (2020). https://doi.org/10.1186/s12874-020-01068-x

It was implemented using the MICE package in R with 5 imputations for each of the imputed datasets. In order to implement propensity score matching with multiply imputed models, a "Within" approach was taken (Mitra & Reiter, 2016). In this approach, treated and controlled units were matched within each imputed dataset. The relevant multivariable regression model was then fitted to each imputed dataset for each outcome/dataset combination, and the resulting 'treatment' estimates and standard errors were averaged using Rubin's rules. All imputed variables are categorical variables, thus a logistic regression was used for in the imputation process. Further sensitivity analysis with different number of multiple imputations was performed and is described in Section 1.6.2 below.

Removing outliers

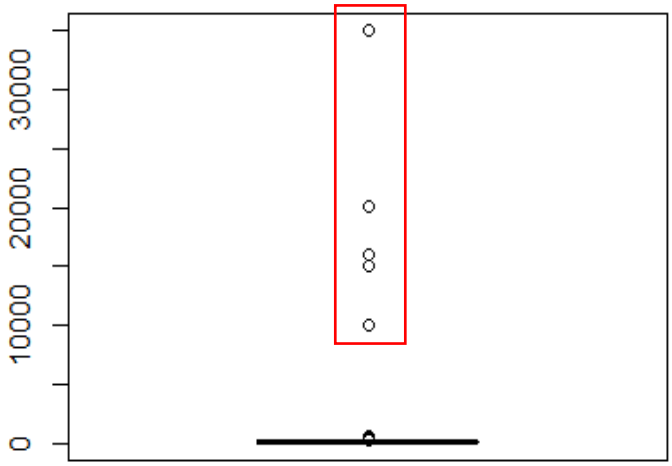
The boxplots below show the outliers present for each of the costs. As some of the spend figures provided by respondents in the survey appeared to be too large an amount for food consumption costs, these were considered as measurement errors and removed (highlighted in red box). Similar regression analysis was performed without outliers removed and the difference in estimates between the two analyses was small. Thus, the primary analysis presented is with outliers removed.

Weekly Food Diary Costs



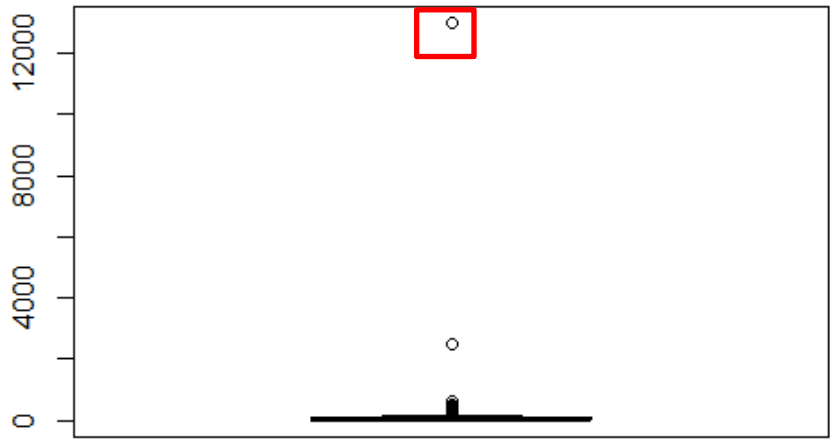
There is a clear outlier above £2500, which we will drop for the analysis going forward. There appears to be another outlier around £1000, which was kept in the analysis as the distance between it and the Q1 line is not too far.

Weekly Groceries Costs



The boxplot clearly shows there are five points that are distanced further above the Q1 line, which have been identified as outliers to be removed. It is assumed that spending £10000 or more weekly on groceries (excluding eating out / takeaway spend) is not realistic and may represent a data error. Thus, these points are removed to ensure they won't distort the additional costs.

Weekly Eating Out / Takeaway Costs



The boxplot for eating out/takeaway spend shows a significant outlier at around £13000. While there appears to be another outlier at £2500, this observation has been kept as it is not far from the Q1 line and could be a true outlier. The £13000 observation, on the other hand, is assumed to be unrealistic and thus, has been removed.

Results were also regenerated with the outliers kept in the datasets. Among the nine datasets presented in Section 1.1 in this appendix, only four of those included outliers. They are:

- **Weekly Food Diary Costs**
  - Dataset 3: consisting of FA and non-FHS – 1 outlier removed
- **Weekly Groceries Costs**
  - Dataset 5: consisting of CD and non-FHS – 3 outliers removed
  - Dataset 6: consisting of FA and non-FHS – 1 outlier removed
- **Monthly Eating Out / Takeaway Spend**
  - Dataset 9: consisting of FA and non-FHS – 1 outlier removed

For Datasets 6 and 9, the results were similar even with the removal of outliers. However, for Datasets 3 and 5, the estimates of the cost difference between FA / CD and non-FHS were 5-10% higher than when the outliers were removed. However, these outliers can be reasonably assumed to be data errors (for example, spending £35000 per week on groceries) and if these were included, it could lead to misleading and results in overinflated estimates.

Propensity score matching

Propensity Score Matching (PSM) was applied using the "nearest neighbour" method. The logit of the propensity score was used as the matching scale with a caliper width equal to 0.2 of the standard deviation of the logit of the propensity score, in line with the recommendations of Austin (2011)[10]. Variables used in deriving the propensity score are similar to the demographic and household characteristics used in the multivariate regression which are:

- Household size
- Household income
- Region
- Gender
- Education
- Age
- Ethnicity

[10] Austin P. C. (2011). An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. Multivariate behavioral research, 46(3), 399–424. https://doi.org/10.1080/00273171.2011.568786

- Geography
- Place of shopping (for example, large supermarket / online / specialist shops)

As mentioned in the section (section 1.1) before in this appendix, PSM was performed for each type of FHS (CD, FA, and FIO) with the non-FHS group and for each type of food consumption costs. The balance statistics can be found in Appendix 10.

A matching assessment was done on the log-linear regression analysis (comparing FIO to non-FHS when using Food Diary Costs) with 5 imputations to determine the best method to use. Pre and post matching standardised mean differences were compared using different Matching methods. Methods tested were:

- "Nearest neighbour" matching with a 0.2 caliper
- "Nearest neighbour" matching with a 0.01 caliper
- "Exact" matching (not included in the table below)
- "Full" matching with probit link
- "Full" matching with logit link

Except for "exact" matching, none of the other matching methods were able to achieve negligible covariate imbalance using a commonly used threshold (standardised mean differences, SMD< 0.1 for all matched variables; Austin, 2011)[1]. For "Nearest neighbour" matching with a 0.01 caliper. more than 50% of the FHS household observations were unmatched and thus would have been left out of the analysis. Meanwhile, for "full" matching[11], although the sample size would have remained large, the matching was not adequate with many matched variables with standardised mean differences > 0.1. The matching assessment with standardised mean differences is presented in the table below (standardised mean differences < or close to 0.1 are highlighted in bold)

[11] Full matching (also known as optimal full matching) is a matching method which assigns every treated and control unit to one subclass each. It then computes weights based on subclass and these weights act like propensity score weights to be used to estimate a weighted treatment effect. (MatchIT specification from cran.r-project repository)

Table 2: Matching assessment showing the standardised mean difference for each variable from both FHS (n = 1,225) and non-FHS household (n = 1,530) group survey conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

Variables	Pre-matched	Matched (using nearest neighbour and caliper = 0.2)	Matched (using nearest neighbour and caliper 0.01)	Matched (using Full and probit link)	Matched (using Full and logit link)
Household size – Large household	-0.2147	**0.1313**	**0**	**0.0603**	-1.9001
Household size – Medium household	-0.072	0.1415	0.2083	-1.0903	0.2272
Household size – Single household	0.2245	**-0.0224**	**-0.0566**	0.4208	0.4465
Household size – Small household	-0.0079	-0.17	**-0.1192**	0.4838	0.5351
Household income - High	-0.1213	**0**	**-0.0958**	0.1856	0.2015
Household income - Low	0.3618	**0.0786**	**-0.0496**	0.4963	0.5528
Household income - Medium	-0.0235	**-0.0778**	**0.0982**	-0.7317	0.3682
Household income – Very High	-0.3998	**0**	**0.0406**	0.162	-1.7721

Variables	Pre-matched	Matched (using nearest neighbour and caliper = 0.2)	Matched (using nearest neighbour and caliper 0.01)	Matched (using Full and probit link)	Matched (using Full and logit link)
Region – England	-1.0216	**-0.133**	**0**	-0.9752	0.154
Region – Norther Ireland	0.4515	**0.0223**	**0.0281**	0.4311	0.3987
Region – Wales	0.6755	**0.1209**	**-0.0254**	0.6448	-0.5234
Gender – Female	-0.6995	**-0.1511**	**0**	0.5539	-0.5468
Gender – Male	0.7164	**0.1511**	**0**	-0.5536	0.547
Gender – Other	-0.3441	**0**	**0**	-0.0066	-0.0033
Education - Entry level education (NQF Levels 1, 2, 3)	0.5068	**0.0191**	**-0.0724**	-0.5943	0.5462
Education - Entry level education (NQF Levels 4, 5, 6, 7, 8)	-0.5894	**-0.1135**	**0.0716**	0.5004	-0.6283
Education – No qualifications	0.214	0.2305	**0**	0.214	0.214

Variables	Pre-matched	Matched (using nearest neighbour and caliper = 0.2)	Matched (using nearest neighbour and caliper 0.01)	Matched (using Full and probit link)	Matched (using Full and logit link)
Age 18-19	0.0443	0.2133	**0**	0.0443	0.0443
Age 20-29	-0.2013	0.1499	-0.2365	-2.302	-0.2262
Age 30-39	-0.0732	**0.0807**	**0.1696**	0.3008	0.3227
Age 40-49	-0.1164	**0.0959**	**-0.0303**	0.2935	-1.1216
Age 50-59	-0.0731	**-0.2523**	**-0.2026**	0.2365	0.3101
Age 60-69	0.2597	**-0.0437**	**0.0827**	0.3641	0.3709
Age 70-79	0.1613	**0.058**	**0.183**	0.2934	0.2974
Age 80+	-0.1365	**-0.09**	**0**	0.0624	-0.0125
Ethnicity – BAME	-0.0797	**0.325**	**0.1758**	0.1625	0.1926
Ethnicity – Other	0.0443	**0**	**0**	0.0443	0.0443
Ethnicity – White	0.0685	-0.3182	-0.1721	-0.1685	-0.198
Geography - Rural	-0.3061	**0.1102**	**0.0278**	0.3253	0.3808
Geography - Urban	0.3061	**-0.1102**	**-0.0278**	-0.3253	-0.3808
		Sample Sizes: Matched: 106 from control and 106 from treated	Sample Sizes: Matched: 84 from control and 84 from treated	Sample Sizes: Matched (Effective Sample Size): 2.69 from	Sample Sizes: Matched (Effective Sample Size): 3 from

Variables	Pre-matched	Matched (using nearest neighbour and caliper = 0.2)	Matched (using nearest neighbour and caliper 0.01)	Matched (using Full and probit link)	Matched (using Full and logit link)
		FHS group un-matched: 12 Non-FHS group un-matched: 1424	FHS group un-matched: 34 Non-FHS group un-matched: 1446	control and 1530 from treated	control and 1530 from treated

Thus, the first option of "Nearest neighbour" matching with a 0.2 caliper was chosen as it matched more than 50% of observations but still achieved a high degree of covariate balance across most of the matching variables.

It must be noted that for Food Diary Costs, the matching for FIO with the non-FHS group is poorer than the matching for CD with the non-FHS group with the matching method above. As also mentioned above, the matching can be improved in terms of achieving covariate balance but then more than 50% of the observations will be unmatched resulting in substantial loss of power. For example, the matching for FIO with the non-FHS group had nearly 30% of sub-characteristics[12] with standardised mean differences of > 0.1 whilst the matching for CD with the non-FHS group had only about 6% of sub-characteristics with standardised mean differences of > 0.1. However, for Weekly Groceries Costs, the matching results were similar across the three groups, with only about 3% of sub-characteristics (equivalent to 1 sub-characteristic) with standardised mean differences of > 0.1. We address any lack of covariate balance by using multivariable regression adjustment for the relevant confounding factors after selecting the matched samples. This doubly robust approach is recommended as a strategy

[12] Sub-characteristics here are defined as the specific groups within a demographic or household characteristic. For example, sub-characteristics of the characteristic 'region' will be England, Northern Ireland, and Wales

for removing confounding if imbalance exists after propensity score matching (Nguyen et al, 2017)[13].

Regression analysis

Multivariate regressions were performed with a list of key demographic variables (controls) included to reduce confounding bias. The fully adjusted model was constructed by sequentially adding all relevant control variables using a manual stepwise procedure. The control variables were added in order of univariate significance and magnitude of effect on the outcome.

Initially, a Box-Cox transformation was used on the response variables (the different costs) to transform the data to help ensure the model assumptions are valid (including independence of errors, equal variance of errors and normality of residuals). This is done by recovering a value of the power parameter, lambda, that will achieve the maximum log-likelihood and transforming the response variable with the lambda value.[14] The lambda value that was found, 0.2, made it difficult to numerically interpret the regression analysis results. Thus, as a lambda value of zero was close to the maximum log-likelihood, the final model used has a log transformed response variable (when lambda equals to zero, it is a log-transformation), which will allow for easier numerical interpretation.

For eating out / takeaway spend, there was a higher number of observations that are zero before any transformation or addition was applied. The presence of excess zeroes in the dataset could contribute to overdispersion and/or zero inflation in the dataset, which can lead to biased estimates and errors in interpretation of the result. Thus, a multi-stage model was initially used to deal with the excess zeroes, which combines the use of a logistic regression and a log-linear regression (Fletcher et al., 2005). In this method, a logistic regression is used to model the occurrence of a zero value and a log-linear regression is used to model the positive costs. The results from the log-linear regression part of the multi-stage model were similar to the model where all cost values underwent a $\log(C_i + 1)$ transformation, in terms of statistical significance and direction of effect. Meanwhile, the binomial regression results were

[13] Nguyen, TL., Collins, G.S., Spence, J. et al. Double-adjustment in propensity score matching analysis: choosing a threshold for considering residual imbalance. BMC Med Res Methodol 17, 78 (2017). https://doi.org/10.1186/s12874-017-0338-0

[14] Box-Cox equation used to transform the variables; $y(\lambda) = \frac{y^{\lambda}-1}{\lambda}$ (Box,1964)

statistically insignificant for the 'with controls' dataset. Thus, the log(C_i + 1) transformation was used in a single stage regression for eating out / takeaway spend to ensure consistency with the other cost variables.

The full multivariate regression equation is presented below:

$$log(C_i + 1) = \alpha + \beta_1 T_{1,i} + \ldots + \beta_{p-1} T_{p-1,i} + \beta_2 Control\_Variables + e_i$$

Where;

C_i = Food consumption costs for the *i*-th household[15]

α = Intercept

β_1 = Average difference in log cost between households with FHS and non-FHS

T_i = FHS type / non-FHS in *i*-th household

p = Number of categories of exposure variables (eg. three groups of FHS)

β_2 = Vector of coefficients for control variables used

$Control\_Variables$ = List of control variables used which are age, gender, ethnicity, education, household income, household size, region, geography (rural/urban household), place of shopping, and frequency of eating out

e_i = Error term

Two log linear regression methods were used for fitting the outcome models and the results are compared in Appendix 7. They were applied to check whether the results were sensitive to different model specifications. Previous studies have shown that no single method is best in all circumstances and it is recommended to consider alternative estimation approaches to allow for common data issues such as heteroscedasticity. The two methods we considered are:

- Log-linear regression (ordinary least squares regression on ln(y))
- Generalised linear model (GLM) with a Gamma family and a log-link

The control variables included in both types of regressions are as mentioned above but will be listed again below:

- Household size

[15] The model presented here is for the Gamma family with log-link. For the log linear regression, the food consumption costs will be $\log(C_i + 1)$

- Household income
- Region
- Gender
- Education
- Age
- Ethnicity
- Geography
- Place of shopping (ie large supermarket / online / specialist shops)

There were also 4/1559 (0.26%) and 145/1559 (9.3%) observations that were zeroes for weekly groceries spend and eating out / takeaway spend, respectively. This was handled by adding a constant term to the costs before the log-transformation was applied, thus the cost variables are represented as "$(C_i + 1)$".[16] Addition of the constant term ensures the zero costs are strictly positive.

Use of the logarithmic transformation for the food consumption costs was chosen as this provides a natural basis for modelling skewed outcomes that are all-positive. The log-transformation can help ensure the assumptions of additivity and linearity are reasonable and improve model fit (Gelman and Hill, 2007). The resulting linear model on the logarithmic scale corresponds to a multiplicative model on the original scale and ensures all predictions of costs are necessarily positive. Use of the generalised linear model with a Gamma family and a log-link provides an alternative, and potentially more flexible, way to model the cost outcome that can appropriately model the error structure (Manning and Mullahy, 2001)[17].

The results from the Gamma distribution with log link are overall similar to the results generated from the log-linear regressions. However, there is one exception when weekly food diary costs are used as the outcome. The food diary costs estimates generated from the log-linear regression model are not statistically significant for the comparison of all three FHS groups vs the non-FHS group. On the other hand, the results generated from the Gamma distribution

[16] A quasi-likelihood model (which could have included the zeroes) with a "log" link and variance of mean-squared was explored for the eating out / takeaway analysis as there is a higher proportion of zeroes. However, the algorithms did not converge, and so it was not possible to obtain valid model estimates.

[17] Manning, W. G. and J. Mullahy (2001). 'Estimating log models: to transform or not to transform?' Journal of Health Economics, 20: 461-94.

with log link are statistically significant when comparing those in the FIO category and those with CD with the non-FHS group. A brief comparison of the weekly food diary cost estimates and their p-values from the two approaches are shown below:

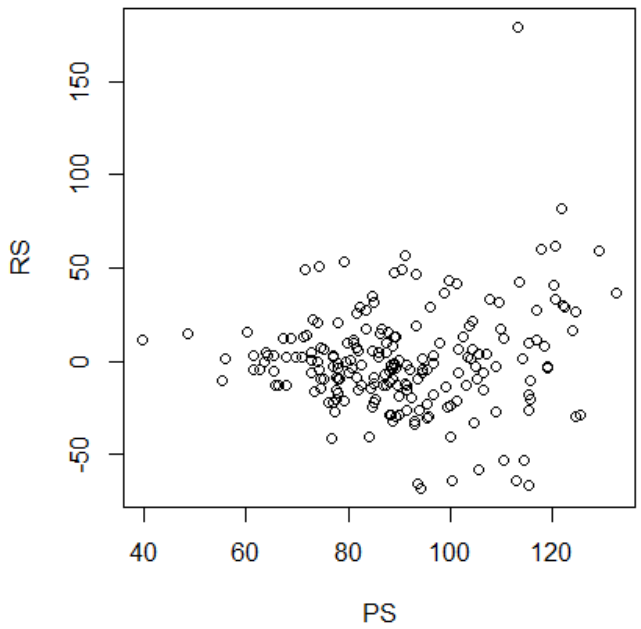
Table 3: Comparison of weekly food diary costs estimates from Gamma distribution with log link and Log-linear approaches from FHS (n = 1,225) and non-FHS household (n = 1,530) group survey conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

-	**How much more those in FIO category spend than non-FHS**	**How much more those in with CD spend than non-FHS**	**How much more those with FA spend than non-FHS**
Gamma distribution with log link	25.3% [p = 0.008]	17.0% [p = 0.009]	20.3% [p = 0.05]
Log-linear	14.9% [p = 0.2]	4.8% [p = 0.4]	6.2% [p = 0.6]

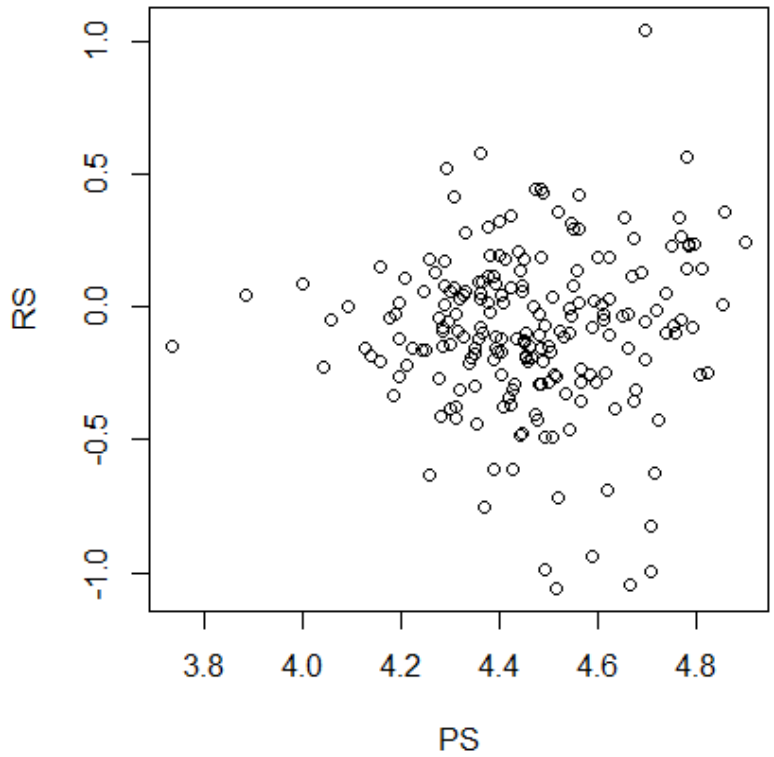
Thus, as seen from the table, there is a difference in the statistical significance and estimates of results generated between the gamma distribution with log link and the log-linear regression model. The residual plots were then analysed for these outcome / FHS type combinations. These plots are presented below and show some evidence of heteroscedasticity for both models. We note that the ordinary least squares (OLS) log-linear regression estimates can be biased in the presence of heteroscedasticity. The GLM gamma model protects against bias in the presence of heteroscedasticity but can be less precise than the OLS model in some scenarios. Our emphasis is on minimising bias and so we selected the GLM with a gamma family and log link as the main model of analysis – and this is the one presented in Section 5 of the main report.

Weekly Food Diary Costs – Comparison of FIO vs Non-FHS

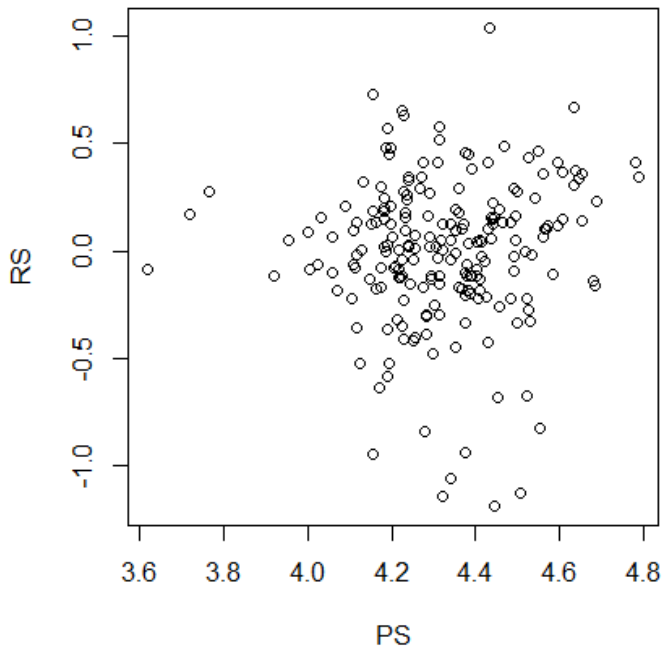
Residual plot of original data



Residual plot of Gamma family with log link

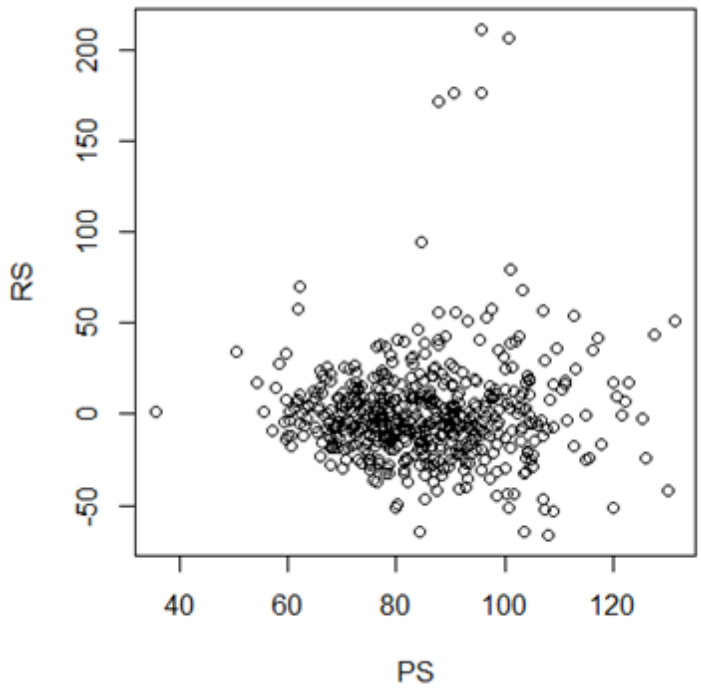


Residual plot of log-linear regression

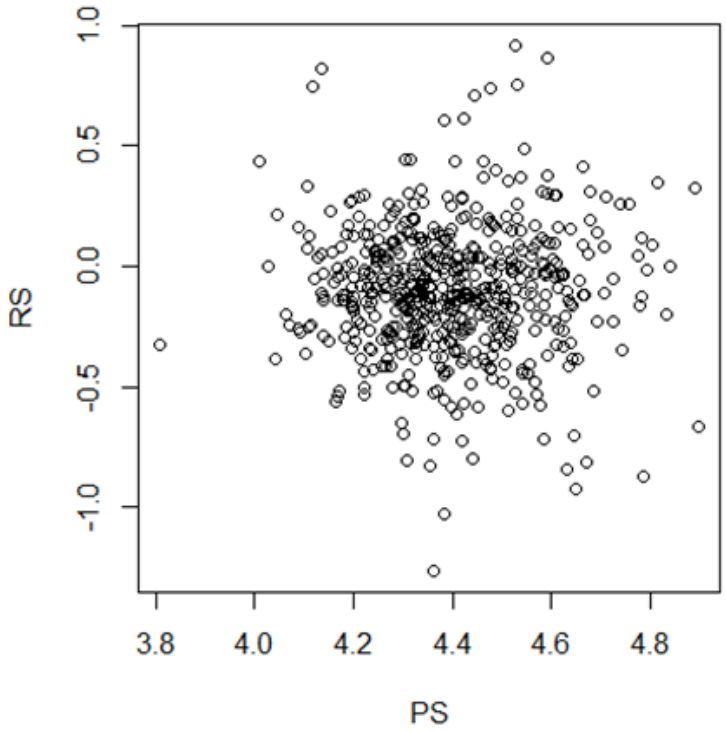


Weekly Food Diary Costs – Comparison of CD vs Non-FHS

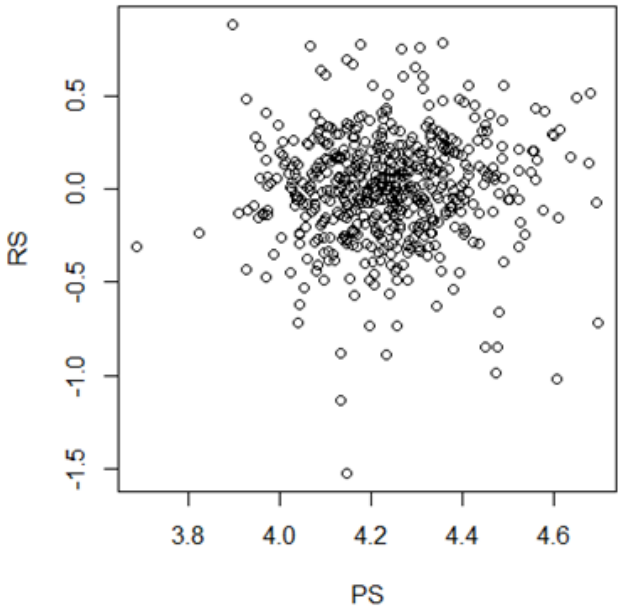
Residual plot of original data



Residual plot of Gamma family with log link



Residual plot of log-linear regression



The full results from the log-linear regression and Gamma distribution with log-link can be found in Appendix 7.

Sensitivity analysis

High proportion of females

Due to the very high response rate from females compared to males in the FHS household survey (79%) sensitivity analysis was conducted to address potential response bias and effect modification. In addition to adjusting for any confounding effect of gender, a model with interaction effects was constructed to assess whether the cost differentials between FHS types and non-FHS varies between females and males.

To explain, $FHS\_Presence$ is the exposure variable consisting of either one of the three FHS groups (FIO, CD, or FA) and the non-FHS group. An interaction term of $gender * FHS\_Presence$, was created for the dataset with all types of FHS and non-FHS respondents.

Multivariate regression using a fully adjusted model was then performed for food consumption costs in all datasets with the addition of the appropriate interaction terms. If the coefficients of the interaction terms are significant, this indicates that there is a difference in effect of FHS presence on costs between genders.

Multiple imputation

The final model presented in the main analysis was originally run with five imputations. In general, two to 10 imputations are usually sufficient for the efficiency of point estimates however, higher number of imputations may be needed for standard errors that would not significantly change if data was imputed again (Von Hippel, 2018). Thus, the analysis for the food costs was separately run with imputations of 10, 20, 40, and 100 times to check the sensitivity of the results to different number of imputations. The results are discussed in Section 5.4.2 in the main report.

The results showed that overall, the results remained stable even as the number of imputations increased from five to 100; with the exception of the comparison of FA and non-FHS with Weekly Food Diary Costs. Thus, the results of this comparison presented in the main analysis was generated with 100 imputations whilst the results of other comparisons presented was generated with 5 imputations.

Non-food direct costs data

In addition to the food consumption costs, there are other direct costs. These costs are:

- Kitchen equipment costs
    - Additional costs of kitchen equipment incurred by those living with FHS due to their FHS
- Medical costs
    - Total medical costs consisting of:
        - Nutritional supplement and/or over the counter medication costs
        - Prescription medication costs (for example, adrenaline auto-injectors, antihistamines, and corticosteroids)
        - Specialist medical costs (for example, medical bags, inhalers)

These costs were only collected for the FHs household group survey, thus there is no comparison group survey to use as a comparator and all analysis will focus on difference in cost estimates between FH types.

In the survey, only data on type of kitchen equipment used was collected. These types were then coded into categories (for example, separate toaster, separate prep area, separate chopping board etc.) These kitchen equipment items were then quantified using the average price of the item, which was calculated by taking the average of their prices in different retailers. Retailers are B&Q, Wilko, Tesco, Asda, Currys, and Amazon. These retailers were chosen to try and represent a range of shopping behaviours and demographics. For answers that could not be quantified (ie separate prep area, separate storage etc.), these were assumed to be of zero cost as it is likely that consumers will have existing storage space or prep areas in their homes.

None of the data specified in this section underwent PSM or MI as these costs are not included in the main report due to being out of scope of the research question. However, they have been left in this appendix and results can be found in Appendix 7 for reference.

Removing outliers

As there were no outliers identified for kitchen costs due to the costs being quantified by RSM, all 1225 observations were kept in for the analysis. For medical costs, there were outliers identified for each individual cost category except specialist medical costs. These are detailed as:

Table 4: Outliers removed from medical costs and justification of removal from the FHS (n = 1,225) group survey conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

-	**Cost 1: Nutritional supplements and/or OTC medication (per month)**	**Cost 2: Prescription medication (adrenaline auto-injectors, anti-histamines, corticosteroids) (per month)**
Observations with costs beyond this number are considered as outliers and removed:	£100	£37.40
Justification:	It would be difficult to spend hundreds, let alone thousands of pounds per month on over the counter medicines or nutritional supplements in the UK. Any expenditure above £100 is confirmed to be impossible by Coeliac UK.	The cost of an NHS prepayment annual certificate is £108.10 equating to £9 per month (or £30.25 for a 3 month PPC), therefore anything over £37.40 (4 prescriptions per household per month) is highly unlikely. Pharmacies will usually tell customers who order repeat prescriptions frequently to buy a prepayment certificate.
Number of outliers removed:	12/1559 (0.8%)	20/1559 (1.3%)

Thus, 29/1559 (1.9%) observations were removed for the analysis of total medical costs. Outliers were not removed for Cost 3: Specialist Equipment as there could be special medical equipment that would cost a significant amount, thus it would be difficult to judge whether the reported costs are implausible.

Regression analysis

There were a high number of zeroes with 982/1559 (63%) and 650/1559 (41.7%) zero values for kitchen equipment costs and medical costs, respectively. As described above, the presence of excess zeroes demanded that a different analysis be used. In this case, the multistage model as described in Section 1.1.5 was used to analyse these costs. For the multistage model, two datasets were created where the appropriate regression was performed on the relevant dataset:

- Dataset comprising all observations, but the costs were transformed into zeroes (for costs with zero value) and ones (for all positive costs), for the logistic regression
- Dataset comprising only observations where the costs were positive (higher than zero) for the log-linear regression

For kitchen equipment costs, the log-linear regression model had 577 observations while the logistic regression model has 1,559 observations. For medical costs, the log-linear regression model has 635 observations while the logistic regression model had 1,051 observations (479 missing observations dropped for the analysis). The reduced number of observations used for the medical costs analysis is explained below.

Bootstrapping performed for medical costs

The initial findings for medical costs from the log-linear regression component showed there is a statistically significant difference in positive spending between the FHS types, while this difference was statistically insignificant for kitchen equipment costs. Additionally, the differences in odd of spending on medical costs from the logistic regression were also found to be statistically significant between the FHS types. Thus, additional analysis was performed for medical costs to combine estimates from the two components of the model using nonparametric bootstrapping. Non-parametric bootstrapping was used as it is the safer option when the underlying specification of the model cannot be accurately ascertained. In addition, the sample size used in this analysis, N = 1051, is large enough that the issue of reproducing spurious fine structure (present in the original sample but not in the population sample) in the simulated data is not relevant. The rest of the section details the specifications of the non-parametric bootstrapping method.

The expected average cost, $\hat{E}(Y)$, is given by equation (1) below (Fletcher et al., 2005):

$$\hat{E}(Y) = \hat{\pi}\hat{\mu}, \quad (1)$$

where

$$\hat{\pi} = \exp\left(x'\hat{\beta}\right) / \{1 + \exp\left(x'\hat{\beta}\right)\} \quad (2)$$

and

$$\hat{\mu} = \exp\left(w'\hat{\theta} + \frac{\hat{\sigma}^2}{2}\right) \quad (3)$$

are estimates of π (expected probability of non-zero medical costs for a survey respondent with vector of covariates x) and μ (expected medical cost for survey respondents that have a non-zero cost) from the logistic and log-linear regression models, respectively. Here,$\hat{\beta}$ is a vector of coefficient estimates from the logistic regression, and x is the corresponding vector of predictor variables. Meanwhile, $\hat{\theta}$ is the vector of coefficient estimates from the log-linear regression, and $\hat{\theta}^2$ is the residual mean square of the model (Fletcher et al., 2005). The estimates of the difference in expected average cost between the FHS types (with FIO as a reference category) and its corresponding confidence intervals were obtained with nonparametric bootstrapping. This involved repeated resampling from the observed data and fitting logistic and log-linear regression models to each bootstrap resample to estimate β, θ, and σ^2. These estimates were combined using equations (2) and (3) to estimate the distribution of $\hat{E}(Y)$. The 2.5th and 97.5th percentiles were chosen to produce a 95% confidence interval from 1000 bootstrap samples. The cost difference between the FHS types and their confidence intervals were then calculated from the bootstrap samples. Due to the complexity of bootstrapping multiple imputed data, complete cases analysis was used (where rows with missing values were dropped for the analysis) for medical costs, which reduced the total observations used.

Indirect costs data

The indirect costs asked in the survey are as:

Days lost from paid work due to FHS: FHS households were asked how many days of absence from paid work they had in the past year due to FHS.

Days lost from unpaid work due to FHS: FHS households were asked how many unpaid days they had lost in the past year due to FHS. Unpaid work includes days spent on education, training, voluntary work, lost leisure time, caring for others, and housework time.

Extra time spent on food shopping/planning/FHS education due to FHS (Extra time costs): FHS households were asked on the extra time spent on the below activities. These hours were converted into hours per week and summed up to provide a total extra time spent due to FHS

Time on food shopping per week

Time on planning food shop and reading food labels per week

Time to travel further for food shopping per week

Extra time on planning and preparing for eating out/takeaways per month

Extra time on planning and preparing for visiting/hosting friends and family per month

The first outcome, days lost from paid work due to FH was converted into financial cost by multiplying it with the 2019-2020 annual median income of £29,900 (Office of National Statistics, Median Income 2019 to 2020). For the second and third outcome, unpaid work and time spent on food shopping etc. was converted into financial cost with the multiplication of the latest hourly National Living Wage of £8.72 (GOV.UK, April 2020, National Living Wage).

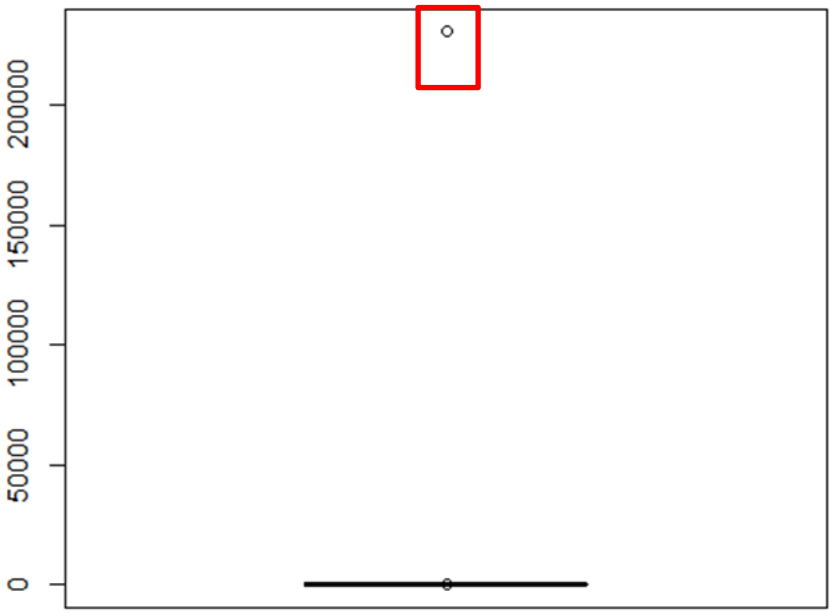
None of the data specified in this section underwent PSM or MI as these costs are not included in the main report due to being out of scope of the research question. However, they have been left in this appendix and results can be found in Appendix 7 for reference.

Removing outliers

For the first two outcomes on days lost from paid work and days lost from unpaid work, there were no outliers identified as the maximum value given by respondents is 365 days, which can be interpreted as one year. Thus, all 1559 observations were kept for the analysis.

For the extra time costs, outliers were also removed using the boxplot method. As some of the time spent per week provided by respondents in the survey appeared to be beyond the maximum number of hours available per week, these were considered as measurement errors and removed (highlighted in red box). Additionally, although there was another outlier (~217 hours) that was close to the Q1 line, it was also removed as it is impossible to spend more than 168 hours per week. Also, the respondent had indicated they spent 200 hours per week alone on food shopping, which is impossible and thus, can be assumed to be a measurement error.

Extra Time Spent Per Week



Regression analysis

Two of the indirect cost variables also suffer from a similar issue of excess zeroes as the kitchen equipment costs and medical costs, with 1196/1559 (76.7%) zero values for days lost from paid work due to FH, and 1262/1559 (80.9%) for days lost from unpaid work due to FH. As a natural model for paid work days lost and unpaid days lost is a count data model (ie the

response variable has observations that can only take the form of non-negative integer values such as 0,1,2,3,…), a different regression model was used for these two costs. Thus, a negative binomial regression was used to produce the estimates as this type of modelling is typically used to model count data with overdispersion of data (when the conditional variance is larger than the conditional mean) and/or a high number of zero values. This regression model can only be used for count data, hence why it was not used for kitchen equipment costs and medical costs (these costs are continuous). For consistency with the other non-linear regression models, only multivariate regression analysis was performed for these costs.

For the third outcome, extra time costs, there are only 6/1559 (0.4%) observations that have zero value, thus the log-linear regression model – that was used for food consumption costs – was applied here as well. This means that a $log(C_i + 1)$ transformation was applied for the extra time costs variable.

Converting household food costs to individual food costs

This section presents how the estimates for food costs have been extrapolated to individual costs and scaled up for the whole population. This was done as the survey collected household costs, however individual costs are needed for the development of the FSA's Cost of Illness model[18]. Additionally, this also provides a big picture of the estimates generated in Chapter 5. The steps used to perform this conversion are:

1. According to the FSA's Food and You 2 Wave 3 survey[19], in the UK, there are 300,000 estimated individuals with coeliac disease, 800,000 with food allergy, and 1.2 million with food intolerance and other conditions. The proportion of those with coeliac disease as a proportion of total FHS population is 13% (300,000 / 2.3 million), the pro-

[18] The FSA is currently developing a COI model that will estimate the annual societal burden of FHS in the UK.
[19] Note: these FHS prevalence figures are 'self-reported clinically diagnosed' and on an FHS only basis so that those with multiple conditions are only counted once to avoid overestimated costs.

portion of individuals living with food allergy is 35% (800,000 / 2.3 million), and the proportion of FIO is 52% (1.2 million / 2.3 million). The total prevalence of FHS in the UK is 3% (2.3 million / 67.1 million[20]).

2. The average weekly spend, per person, on food and drink is £26.04. (Family Food Survey, 2018/19).

3. These allow us to calculate average non-FHS population spend on weekly groceries costs:

$$\text{The average non-FHS population spend [£25.92]} = \frac{\text{The average weekly spend on food and drink [£26.04]}}{\text{The prevalence of non-FHS [0.97]}} + \text{The prevalence of FHS [0.03]} \times \left\{ \text{Proportion of CD [0.13]} \times \text{The average increase in costs for CD [1.119]} + \text{Proportion of FA [0.35]} \times \text{The average increase in costs for FA [1.144]} + \text{Proportion of FIO [0.52]} \times \text{The average increase in costs for FIO} \right\}$$

4. The difference in spending on weekly groceries costs for people living with CD is then the average non-FHS population spend [£25.92] multiplied by the average increase for those with CD [11.9%] (according to Weekly Groceries Costs). This process is repeated for those with FA and FIO, changing the [11.9%] for [14.4%] and [15.8%], respectively.

5. This gives an average weekly difference per person of £3.08, £3.73, and £4.10 for CD, FA, and FIO, respectively

6. The figures from Step 5 can be multiplied by the prevalence of those with CD [300,000], FA [800,000], and those in the FIO category [1.2 million].[21]

[20] Estimated total population in the UK from the ONS in 2020 [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates]

[21] National statistics were used to provide scaling to a national level. Using any in-sample estimates would not have been able to provide any figures in the millions as we only have proportions of each FHS group.

7. Steps 1 to 7 are then repeated for Weekly Food Diary Costs and Weekly Eating Out / Takeaway Costs, which are reported in the table below.

Table 5: Additional weekly spend of CD/FA/FIO adults compared to non-FHS adults in England, Wales, and Northern Ireland for different food consumption costs at a population level

Type of cost	Additional weekly spend of CD adults	Additional weekly spend of FA adults	Additional weekly spend of adults in the FIO category
Weekly Groceries Costs	£ 925,344	£ 2,985,984	£ 4,914,432
Weekly Food Diary Costs	£ 1,319,370	£ 4,201,288	£ 7,854,132
Weekly Eating Out / Takeaway Costs	£ 1,095,147	£ 5,530,104	£ 4,660,200[22]

For weekly eating out / takeaway costs, it must be noted that the difference between those in the FIO category and the non-FHS group is not statistically significant. Thus, caution is needed when interpreting the significance of the figures produced and this caveat must be included in any future work using these weekly eating out / takeaway cost figures. Also, the additional weekly spend for those in the FIO category are higher than those in the CD and FA category as these have been multiplied with the prevalence of their respective FHS type; and there is greater prevalence of those nationally in the FIO category (1.2 million) compared to those in the CD (300,000) and FA (800,000).

These are estimated figures, that assumes the results of our survey can be generalised across the wider population. In addition, the percentage differences captured in the costs were measured at the household level, as opposed to individual level. Thus, we are using estimates of expected increases in costs in FHS groups at the household level as if they apply to the individual level. However, a precise estimate of cost differences at the individual level cannot be generated from the data collected in the survey. The estimates presented in this

[22] This result is not statistically significant

chapter are reliant on the assumption that the costs differences at the household level similarly apply to the individual level. A more accurate figure would require future studies to collect costs on an individual level, although this will be challenging given that spending decisions are generally taken at a household level. Lastly, the only available FHS prevalence and population figures are for the UK whereas our study excludes Scotland because the FSA's jurisdiction does not include Scotland. Thus, this estimated figure assumes that even with the exclusion of Scotland, the FHS prevalence and population figures will not significantly differ.

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Office for National Statistics, Northern Ireland Statistics and Research Agency – Population Estimates 2019

Appendix 7: Regression Tables

Multivariate regression for food consumption costs of FHS households

Table 1: Weekly groceries costs of non-FHS households compared to FHS households, broken down by FHS groups using a generalised linear regression model of Gamma family with log link

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	5.069892***	5.257588***	5.147141***
FHS_presenceNo	-0.14662**	-0.11227***	-0.13454**
hh_sizeMedium HH	-0.02256	-0.11669	-0.04866
hh_sizeSingle HH	-0.52684***	-0.70899***	-0.6902***
hh_sizeSmall HH	-0.24426*	-0.40439***	-0.30407***
hh_incomeLow	-0.32568***	-0.15643**	-0.27457**
hh_incomeMedium	-0.16005*	-0.08784	-0.15267*
hh_incomeVery High	0.192547	0.165483**	0.096182
regionNorthern Ireland	0.015487	0.056119	0.058814
regionWales	-0.08647	-0.04469	-0.05058
genderMale	0.088461	0.048799	0.056789
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.02826	-0.00178	0.015793
educationNo qualifications	-0.09896	-0.11289	-0.1172
age20-29	-0.39007	-0.59108	-0.36637
age30-39	-0.37404	-0.53827	-0.32872
age40-49	-0.39397	-0.55059	-0.33035

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age50-59	-0.36799	-0.50711	-0.2484
age60-69	-0.4428	-0.49506	-0.33442
age70-79	-0.34985	-0.53007	-0.15722
age80+	-0.44395	-0.5937	-0.35238
ethnicityOther	0.41427	0.299245	0.184265
ethnicityWhite	0.151574	0.120971	0.049424
GeographyUrban	-0.03845	-0.03331	-0.07145
shopOnline	0.261938**	0.26901***	0.221547*
shopOther – specialist / independent	-0.24991*	-0.10002	0.187807
N	• 396 (198 from each group) • 36 unmatched from FIO	• 826 (413 from each group) • 235 unmatched from CD	• 448 (224 from each group) • 115 unmatched from FA

P<0.05*,p<0.01**,p<0.001***

Table 2: Weekly groceries costs of non-FHS households compared to FHS households, broken down by FHS groups using a linear regression model with log-transformed costs

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	4.851471***	5.200581***	4.971351***
FHS_presenceNo	-0.15507***	-0.12411***	-0.1513**
hh_sizeMedium HH	-0.05531	-0.14204	-0.02333
hh_sizeSingle HH	-0.54586***	-0.75409***	-0.74564***
hh_sizeSmall HH	-0.22876	-0.40615***	-0.28611***

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
hh_incomeLow	-0.31335***	-0.15401**	-0.31465***
hh_incomeMedium	-0.1594*	-0.07305	-0.14369
hh_incomeVery High	0.18824	0.192658***	0.072481
regionNorthern Ireland	0.046366	0.036115	0.08576
regionWales	-0.06625	-0.04957	-0.00946
genderMale	0.083791	0.045431	0.082843
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.04036	-0.02458	-0.01029
educationNo qualifica-tions	-0.0705	-0.15619	-0.13499
age20-29	-0.29059	-0.62375	-0.28161
age30-39	-0.23223	-0.48864	-0.24319
age40-49	-0.25848	-0.52761	-0.22544
age50-59	-0.22407	-0.47291	-0.15854
age60-69	-0.27229	-0.4389	-0.18728
age70-79	-0.18745	-0.50157	-0.02509
age80+	-0.31496	-0.49461	-0.22865
ethnicityOther	0.477192	0.333313	0.226671
ethnicityWhite	0.156222	0.08584	0.054292
GeographyUrban	-0.03832	-0.03152	-0.06864
shopOnline	0.263131**	0.252676***	0.213661*

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
shopOther – specialist / independent	-0.27182*	-0.17047	0.164776
N	• 396 (198 from each group) • 36 unmatched from FIO	• 826 (413 from each group) • 235 unmatched from CD	• 448 (224 from each group) • 115 unmatched from FA

P<0.05*,p<0.01**,p<0.001***

Table 3: Weekly food diary costs of non-FHS households compared to FHS households, broken down by FHS groups using a generalised linear regression model with Gamma family and log link

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	6.658693***	5.193585***	5.231258***
FHS_presenceNo	-0.22572**	-0.15724**	-0.13332
hh_sizeMedium HH	0.054878	-0.32088**	-0.18285
hh_sizeSingle HH	-0.19289	-0.79026***	-0.49723**
hh_sizeSmall HH	-0.15896	-0.54854***	-0.2493
hh_incomeLow	-0.37392**	-0.20099*	-0.28803
hh_incomeMedium	-0.22024	-0.07342	-0.27328*
hh_incomeVery High	0.053968	0.111448	-0.12558
regionNorthern Ireland	0.008956	0.096838	0.289809
regionWales	-1.30041	-0.07849	0.05233
genderMale	0.130615	0.009336	0.214215
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.001728	0.040234	-0.01281
educationNo qualifications	1.347945	-0.09389	0.029804
age20-29	-2.05415	-0.30156	-0.54399

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age30-39	-1.87387	-0.14454	-0.31731
age40-49	-1.93258	-0.15379	-0.53882
age50-59	-2.123*	-0.17371	-0.50694
age60-69	-2.0413*	-0.13997	-0.67967
age70-79	-2.23094	-0.01113	-0.48073
age80+	-2.28599	-0.43169	-1.11435
ethnicityOther	NA	-0.13669	0.847057
ethnicityWhite	0.187322	-0.00556	0.196675
GeographyUrban	-0.00966	-0.05277	-0.04162
shopOnline	0.086982	0.211223	0.102754
shopOther outlets (eg specialist of independent stores)	-0.1171	0.13489	-0.11852
N	• 206 (103 from each group) • 15 unmatched from FIO	• 560 (280 from each group) • 52 unmatched from CD	• 210 (105 from each group) • 21 unmatched from FA

P<0.05*,p<0.01**,p<0.001***

Table 4: Weekly food diary costs of non-FHS households compared to FHS households, broken down by FHS groups using a linear regression model with log-transformed costs

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	6.536061***	5.012156***	4.947403***
FHS_presenceNo	-0.13859	-0.04707	-0.05984
hh_sizeMedium HH	0.066282	-0.32255**	-0.28183
hh_sizeSingle HH	-0.15883	-0.79978***	-0.60163**
hh_sizeSmall HH	-0.16917	-0.57528***	-0.33264
hh_incomeLow	-0.29313	-0.14603	-0.27642
hh_incomeMedium	-0.14013	0.015326	-0.24243
hh_incomeVery High	0.149583	0.180054	-0.03829
regionNorthern Ireland	-0.00095	0.096533	0.310882
regionWales	-1.43896	-0.08582	0.073842
genderMale	0.236189	0.052212	0.288206
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.00573	0.032343	0.004334
educationNo qualifications	1.372073	-0.07223	0.064814
age20-29	-2.09006*	-0.33529	-0.54173
age30-39	-1.90919*	-0.13875	-0.2873
age40-49	-1.99065*	-0.13549	-0.56646
age50-59	-2.26794*	-0.17238	-0.44623
age60-69	-2.15918*	-0.15291	-0.77665

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age70-79	-2.39103*	-0.10383	-0.40969
age80+	-2.3409*	-0.35588	-1.0776
ethnicityOther	NA	-0.1167	0.978808
ethnicityWhite	0.156474	-0.04207	0.359903
GeographyUrban	-0.03337	-0.10213	-0.09088
shopOnline	0.106394	0.25666	0.167256
shopOther outlets (eg specialist of independent stores)	-0.04526	0.185133	-0.13814
N	• 206 (103 from each group) • 15 unmatched from FIO	• 560 (280 from each group) • 52 unmatched from CD	• 210 (105 from each group) • 21 unmatched from FA

P<0.05*,p<0.01**,p<0.001***

Table 5: Weekly eating out / takeaway costs of non-FHS households compared to FHS households, broken down by FHS groups using a generalised linear regression model with Gamma family and log link

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	3.570008***	3.293492***	3.249974***
FHS_presenceNo	-0.13986	-0.13219*	-0.23637**
hh_sizeMedium HH	-0.11638	-0.06097	-0.1517
hh_sizeSingle HH	-0.39125*	-0.37537**	-0.32526
hh_sizeSmall HH	-0.2001	-0.09733	-0.11776
hh_incomeLow	-0.57358*	-0.40893***	-0.36119*
hh_incomeMedium	-0.25015*	-0.18179*	-0.21987
hh_incomeVery High	0.168795	0.215996*	0.035174

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
regionNorthern Ireland	-0.15642	-0.0355	-0.01655
regionWales	-0.24177	-0.00977	-0.03694
genderMale	0.086705	0.097106	0.09798
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.030013	-0.0905	-0.10416
educationNo qualifications	-0.1349	-0.00927	-0.06694
age20-29	-0.05548	0.212439	0.608835
age30-39	-0.10873	0.235422	0.646587
age40-49	0.049012	0.338168	0.684851
age50-59	0.103429	0.310796	0.709515
age60-69	0.042355	0.371475	0.681092
age70-79	0.276107	0.246352	0.621246
age80+	-0.33892	0.111361	0.517162
ethnicityOther	0.475239	0.161043	0.575634
ethnicityWhite	0.215015	-0.08239	0.108147
GeographyUrban	0.029798	0.072684	0.059807
freq_eota5-6 times a week	-0.01143	0.743685	0.325445
freq_eotaAt least once a day	-0.65759	-0.28492	-0.74884
freq_eotaLess than once a month	-1.67223***	-1.45092***	-1.76573***
freq_eotaNever	-2.74545***	-2.2006***	-2.76828***
freq_eotaOnce a fortnight	-0.78712*	-0.58455**	-0.90631**
freq_eotaOnce a month	-1.1697***	-0.9361***	-1.32024***
freq_eotaOnce or twice a week	-0.45303	-0.14241	-0.60732*

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
N	• 374 obvs (187 from each group) • 47 unmatched from FIO	• 816 obvs (408 from each group) • 243 unmatched from CD	• 440 obvs (220 from each group) • 120 unmatched from FA

P<0.05*,p<0.01**,p<0.001***

Table 6: Weekly eating out / takeaway costs of non-FHS households compared to FHS households, broken down by FHS groups using a linear regression model with log-transformed costs

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	3.646211***	3.114188***	3.184541***
FHS_presenceNo	-0.1431	-0.15222**	-0.25764***
hh_sizeMedium HH	-0.11659	-0.07473	-0.03368
hh_sizeSingle HH	-0.35343	-0.33611**	-0.24384
hh_sizeSmall HH	-0.15916	-0.07783	-0.03377
hh_incomeLow	-0.4969***	-0.42599***	-0.35599**
hh_incomeMedium	-0.18795*	-0.21245**	-0.21851
hh_incomeVery High	0.208226	0.200148*	0.060098
regionNorthern Ireland	-0.07657	-0.08192	0.013386
regionWales	-0.1581	-0.01408	0.011531
genderMale	0.110615	0.071489	0.080343
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.047086	-0.05612	-0.07561

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
educationNo qualifications	0.134493	0.042568	0.018854
age20-29	-0.3162	0.052809	0.306818
age30-39	-0.30397	0.063029	0.35907
age40-49	-0.18932	0.110032	0.396648
age50-59	-0.11973	0.131514	0.429633
age60-69	-0.29976	0.147092	0.36714
age70-79	-0.01686	0.085586	0.342384
age80+	-0.51852	0.03611	0.316811
ethnicityOther	0.300676	0.344378	0.724271
ethnicityWhite	0.191859	-0.04735	0.129696
GeographyUrban	0.04354	0.059788	0.042662
freq_eota5-6 times a week	0.086983	1.082094	0.578607
freq_eotaAt least once a day	-0.59597	-0.02668	-0.61057
freq_eotaLess than once a month	-1.84405***	-1.39172***	-1.83813***
freq_eotaNever	-2.94385***	-2.29619***	-2.83499***
freq_eotaOnce a fortnight	-0.8374	-0.39779*	-0.80689**
freq_eotaOnce a month	-1.22779*	-0.71191***	-1.22301***
freq_eotaOnce or twice a week	-0.55893	0.009924	-0.53686*

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
N	• 374 obvs (187 from each group) • 47 unmatched from FIO	• 816 obvs (408 from each group) • 243 unmatched from CD	• 440 obvs (220 from each group) • 120 unmatched from FA

P<0.05*,p<0.01**,p<0.001***

Multivariate regression for food consumption costs of FHS households with outliers

Table 7: Weekly groceries costs of non-FHS households compared to FHS households where the main person living with FHS is in the CD / FA group using a generalised linear regression model with Gamma family and log link

Dependent variable	Comparison with CD	Comparison with FA
(Intercept)	4.928835	5.243167
FHS_presenceNo	-0.20632	-0.13238
hh_sizeMedium HH	-0.02631	-0.02642
hh_sizeSingle HH	-0.72659	-0.66619
hh_sizeSmall HH	-0.42565	-0.29598
hh_incomeLow	-0.13565	-0.30412
hh_incomeMedium	-0.09086	-0.16143
hh_incomeVery High	0.448657	0.069235
regionNorthern Ireland	0.031658	0.075963
regionWales	-0.09538	-0.05083
genderMale	-0.04148	0.079125
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.029837	0.023304
educationNo qualifications	-0.05026	-0.12334
age20-29	-0.33376	-0.50234
age30-39	-0.28683	-0.45545
age40-49	-0.01772	-0.45884
age50-59	-0.23175	-0.37867
age60-69	-0.22374	-0.47342
age70-79	-0.19007	-0.27896

Dependent variable	Comparison with CD	Comparison with FA
age80+	-0.20207	-0.49842
ethnicityOther	0.382004	0.195525
ethnicityWhite	0.128156	0.080462
GeographyUrban	0.002747	-0.07811
shopOnline	1.152746	0.229299
shopOther outlets (eg specialist or independent stores)	-0.1224	0.157393

P<0.05*,p<0.01**,p<0.001***

Table 8: Weekly food diary costs of non-FHS households compared to FHS households where the main person living with FHS is in the FA group using a generalised linear regression model with Gamma family and log link

Dependent variable	Comparison with FA
(Intercept)	5.327922***
FHS_presenceNo	-0.2909*
hh_sizeMedium HH	-0.25546
hh_sizeSingle HH	-0.76788*
hh_sizeSmall HH	-0.21687
hh_incomeLow	0.149418
hh_incomeMedium	-0.1661
hh_incomeVery High	-0.1114
regionNorthern Ireland	0.106975
regionWales	-0.16581
genderMale	0.14063
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.17791
educationNo qualifications	-0.18577
age20-29	-0.6962
age30-39	-0.41093
age40-49	-0.61665
age50-59	-0.13366
age60-69	-0.84517
age70-79	-0.6109
age80+	-0.71236

Dependent variable	Comparison with FA
ethnicityOther	0.582301
ethnicityWhite	0.188841
GeographyUrban	-0.23511
shopOnline	0.06567
shopOther outlets (for example, specialist or independent stores)	0.10865

P<0.05*,p<0.01**,p<0.001***

Table 9: Weekly eating out / takeaway costs of non-FHS households compared to FHS households where the main person living with FHS is in the FA group using a generalised linear regression model with Gamma family and log link

Dependent variable	Comparison with FA
(Intercept)	3.404369
FHS_presenceNo	-0.22325
hh_sizeMedium HH	-0.12936
hh_sizeSingle HH	-0.28466
hh_sizeSmall HH	-0.05531
hh_incomeLow	-0.39573
hh_incomeMedium	-0.22942
hh_incomeVery High	0.016528
regionNorthern Ireland	0.04523
regionWales	-0.01721
genderMale	0.146782
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.1218
educationNo qualifications	-0.13938
age20-29	0.438157
age30-39	0.523793
age40-49	0.538897
age50-59	0.518948
age60-69	0.531079
age70-79	0.416557
age80+	0.342913
ethnicityOther	0.473565

Dependent variable	Comparison with FA
ethnicityWhite	0.013139
GeographyUrban	0.018898
freq_eota5-6 times a week	0.377375
freq_eotaAt least once a day	-0.67598
freq_eotaLess than once a month	-1.67527
freq_eotaNever	-2.74888
freq_eotaOnce a fortnight	-0.83909
freq_eotaOnce a month	-1.21598
freq_eotaOnce or twice a week	-0.4952

P<0.05*,p<0.01**,p<0.001***

Sensitivity analysis for food consumption costs

High proportion of female respondents

Table 10: Weekly food diary costs of non-FHS households compared to FHS households where the main person living with FHS is in the FIO group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	6.670877	0.983119	6.785425	20.195	1.28E-06	4.621397	8.720358
FHS_presenceNo	-0.2229	0.087363	-2.55137	91.37352	1.24E-02	-0.39642	-0.04937
hh_sizeMedium HH	0.057391	0.142878	0.401677	97.96878	6.89E-01	-0.22615	0.340928
hh_sizeSingle HH	-0.19152	0.183983	-1.04098	48.26433	3.03E-01	-0.56139	0.178347
hh_sizeSmall HH	-0.15815	0.139668	-1.1323	52.94614	2.63E-01	-0.43829	0.121999
hh_incomeLow	-0.37711	0.134679	-2.80008	61.46044	6.82E-03	-0.64638	-0.10785
hh_incomeMedium	-0.22097	0.127821	-1.72874	26.92121	9.53E-02	-0.48327	0.041334
hh_incomeVery High	0.05044	0.13804	0.3654	55.36328	7.16E-01	-0.22616	0.327037
regionNorthern Ireland	0.011815	0.181264	0.06518	119.8549	9.48E-01	-0.34708	0.370709
regionWales	-1.30327	0.93388	-1.39555	5.894239	2.13E-01	-3.59837	0.991825
genderMale	0.13817	0.173295	0.797311	165.2265	4.26E-01	-0.20399	0.480328
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.002933	0.120777	0.024284	35.04653	9.81E-01	-0.24225	0.248112

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
educationNo qualifications	1.362882	0.996774	1.367292	7.394381	2.12E-01	-0.96887	3.694633
age20-29	-2.0663	0.948978	-2.17739	24.18382	3.94E-02	-4.02411	-0.10849
age30-39	-1.88595	0.893126	-2.11163	34.15745	4.21E-02	-3.70069	-0.07121
age40-49	-1.94494	0.948061	-2.0515	21.21999	5.28E-02	-3.9153	0.025414
age50-59	-2.1326	0.932235	-2.28762	25.55563	3.07E-02	-4.05046	-0.21474
age60-69	-2.05144	0.964297	-2.1274	21.67879	4.50E-02	-4.05299	-0.04989
age70-79	-2.24078	0.967118	-2.31696	22.13686	3.01E-02	-4.24574	-0.23582
age80+	-2.29734	0.956043	-2.40297	28.58502	2.30E-02	-4.2539	-0.34078
ethnicityWhite	0.184239	0.202017	0.911997	26.80696	3.70E-01	-0.23041	0.598882
GeographyUrban	-0.00973	0.088505	-0.10994	124.8352	9.13E-01	-0.18489	0.165435
shopOnline	0.086781	0.133386	0.650595	60.85986	5.18E-01	-0.17995	0.353516
shopOther outlets (eg specialist or independent stores)	-0.12104	0.248751	-0.48658	40.85719	6.29E-01	-0.62345	0.381379
FHS_presenceNo:gender-Male	-0.01895	0.304051	-0.06233	23.11391	9.51E-01	-0.64776	0.609854

Table 11: Weekly food diary costs of non-FHS households compared to FHS households where the main person living with FHS is in the CD group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	5.201945	0.45634	11.39928	101.8606	0.00E+00	4.296782	6.107108
FHS_presenceNo	-0.21246	0.065856	-3.22617	447.9446	1.35E-03	-0.34189	-0.08304
hh_sizeMedium HH	-0.31688	0.113064	-2.80262	261.3085	5.45E-03	-0.53951	-0.09424
hh_sizeSingle HH	-0.7977	0.121328	-6.57473	356.441	1.74E-10	-1.03631	-0.55909
hh_sizeSmall HH	-0.54545	0.106201	-5.13598	121.74	1.08E-06	-0.75569	-0.33521
hh_incomeLow	-0.19791	0.096745	-2.04565	108.5148	4.32E-02	-0.38966	-0.00615
hh_incomeMedium	-0.07146	0.08684	-0.82292	245.7133	4.11E-01	-0.24251	0.099584
hh_incomeVery High	0.113148	0.110224	1.026524	105.6775	3.07E-01	-0.10539	0.331685
regionNorthern Ireland	0.101433	0.132231	0.767092	350.5307	4.44E-01	-0.15863	0.361499

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
regionWales	-0.0978	0.133688	-0.73155	51.31697	4.68E-01	-0.36615	0.17055
genderMale	-0.11552	0.101532	-1.13773	291.5489	2.56E-01	-0.31535	0.084313
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.041552	0.075367	0.551327	59.28896	5.83E-01	-0.10924	0.192345
educationNo qualifications	-0.0897	0.17041	-0.52636	38.5063	6.02E-01	-0.43452	0.25513
age20-29	-0.31962	0.425939	-0.75038	72.82169	4.55E-01	-1.16855	0.529314
age30-39	-0.16544	0.431304	-0.38358	63.20062	7.03E-01	-1.02728	0.696398
age40-49	-0.17672	0.420859	-0.4199	81.19096	6.76E-01	-1.01406	0.660629
age50-59	-0.18681	0.425248	-0.4393	65.67473	6.62E-01	-1.03592	0.662303
age60-69	-0.15183	0.43763	-0.34695	51.11389	7.30E-01	-1.03036	0.726697
age70-79	-0.02287	0.425685	-0.05372	77.03883	9.57E-01	-0.87051	0.82477
age80+	-0.40561	0.499964	-0.81128	55.57825	4.21E-01	-1.40733	0.596104
ethnicityOther	-0.18407	0.514186	-0.35799	184.7085	7.21E-01	-1.19851	0.830361
ethnicityWhite	0.020133	0.19119	0.105303	103.4064	9.16E-01	-0.35903	0.399296
GeographyUrban	-0.04608	0.063787	-0.72239	423.9698	4.70E-01	-0.17146	0.079299
shopOnline	0.216469	0.138731	1.560355	85.02332	1.22E-01	-0.05936	0.492302
shopOther outlets (eg specialist or independent stores)	0.13548	0.201745	0.671541	263.5025	5.02E-01	-0.26176	0.532718
FHS_presenceNo:genderMale	0.236897	0.152354	1.554913	63.71525	1.25E-01	-0.06749	0.541286

Table 12: Weekly food diary costs of non-FHS households compared to FHS households where the main person living with FHS is in the FA group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	5.593424	0.700675	7.982903	83.36878	6.86E-12	4.1999	6.986948

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
FHS_presenceNo	-0.21094	0.098552	-2.14038	128.3687	3.42E-02	-0.40593	-0.01594
hh_sizeMedium HH	-0.15831	0.186731	-0.84778	130.6603	3.98E-01	-0.52771	0.211101
hh_sizeSingle HH	-0.47802	0.207183	-2.30724	114.7545	2.28E-02	-0.88842	-0.06762
hh_sizeSmall HH	-0.22538	0.166487	-1.35374	120.0558	1.78E-01	-0.55501	0.104252
hh_incomeLow	-0.31266	0.153415	-2.03799	113.4462	4.39E-02	-0.61659	-0.00873
hh_incomeMedium	-0.27101	0.127601	-2.12389	121.3975	3.57E-02	-0.52362	-0.0184
hh_incomeVery High	-0.14858	0.150774	-0.98543	111.4771	3.27E-01	-0.44733	0.150178
regionNorthern Ireland	0.251034	0.228887	1.096759	122.9352	2.75E-01	-0.20204	0.704105
regionWales	-0.02144	0.195989	-0.10939	130.3115	9.13E-01	-0.40917	0.366293
genderMale	0.065888	0.163423	0.403178	165.8105	6.87E-01	-0.25677	0.388546
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.020688	0.119389	0.173283	114.1014	8.63E-01	-0.21582	0.257194
educationNo qualifications	-0.1796	0.522373	-0.34382	128.9929	7.32E-01	-1.21313	0.853925
age20-29	-0.88398	0.649009	-1.36205	93.78398	1.76E-01	-2.17265	0.404678
age30-39	-0.62553	0.670275	-0.93324	85.28253	3.53E-01	-1.95815	0.707094

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
age40-49	-0.85575	0.670451	-1.27638	83.44739	2.05E-01	-2.18914	0.477646
age50-59	-0.79531	0.67272	-1.18223	85.50752	2.40E-01	-2.13275	0.542122
age60-69	-0.96597	0.664968	-1.45265	88.13483	1.50E-01	-2.28743	0.355488
age70-79	-0.74168	0.673842	-1.10068	88.02068	2.74E-01	-2.0808	0.59743
age80+	-1.29952	0.752466	-1.72702	98.76789	8.73E-02	-2.79262	0.193575
ethnicityOther	0.688582	0.693502	0.992905	161.6112	3.22E-01	-0.68091	2.058077
ethnicityWhite	0.128811	0.21799	0.590902	95.46817	5.56E-01	-0.30393	0.561548
GeographyUrban	-0.03426	0.099428	-0.34453	138.3558	7.31E-01	-0.23085	0.162338
shopOnline	0.070228	0.167396	0.419534	120.3244	6.76E-01	-0.2612	0.401652
shopOther outlets (eg specialist or independent stores)	-0.03224	0.428851	-0.07519	133.3953	9.40E-01	-0.88047	0.815984
FHS_presenceNo:gender-Male	0.166569	0.270936	0.614789	118.6135	5.40E-01	-0.36993	0.703067

Table 13: Weekly groceries costs of non-FHS households compared to FHS households where the main person living with FHS is in the FIO group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	5.013086	0.356567	14.05929	175.1532	0	4.309365	5.716808

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
FHS_presenceNo	-0.11203	0.050792	-2.20559	192.3404	0.028597	-0.21221	-0.01185
hh_sizeMediumHH	-0.01658	0.109288	-0.15174	21.62601	0.880797	-0.24346	0.210294
hh_sizeSingle HH	-0.51477	0.118046	-4.36077	30.90333	0.000134	-0.75556	-0.27398
hh_sizeSmall HH	-0.24619	0.112836	-2.18185	13.47406	0.047375	-0.48909	-0.00329
hh_incomeLow	-0.31597	0.081052	-3.89831	96.49074	0.000179	-0.47684	-0.15509
hh_incomeMedium	-0.15314	0.078129	-1.96008	22.87993	0.062276	-0.31481	0.00853
hh_incomeVeryHigh	0.197255	0.098243	2.007824	17.64234	0.060227	-0.00945	0.403956
regionNorthernIreland	-0.00304	0.13568	-0.02244	17.05152	0.982356	-0.28924	0.28315
regionWales	-0.05952	0.130959	-0.45451	146.429	0.650137	-0.31834	0.199292
genderMale	0.202062	0.098789	2.045389	103.9046	0.043343	0.006158	0.397967

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.03433	0.058481	-0.58706	204.1066	0.557815	-0.14964	0.080973
educationNo qualifications	-0.1019	0.177893	-0.57282	41.70759	0.569839	-0.46098	0.257176
age20-29	-0.3639	0.334788	-1.08696	283.4637	0.277976	-1.02289	0.295084
age30-39	-0.33989	0.342478	-0.99243	200.7221	0.322181	-1.0152	0.33543
age40-49	-0.35485	0.338812	-1.04733	217.0875	0.296112	-1.02263	0.312934
age50-59	-0.33999	0.336024	-1.01181	250.5408	0.312604	-1.00178	0.321799
age60-69	-0.40842	0.349611	-1.16822	153.8265	0.244527	-1.09908	0.282237
age70-79	-0.31145	0.353644	-0.8807	172.4409	0.379709	-1.00948	0.386576
age80+	-0.44246	0.366723	-1.20653	240.1008	0.2288	-1.16487	0.279942

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
ethnicityOther	0.480114	0.287247	1.671433	360.9406	0.095503	-0.08477	1.045002
ethnicityWhite	0.160067	0.102999	1.554063	37.1591	0.128646	-0.0486	0.368732
GeographyUrban	-0.04331	0.053065	-0.81608	253.4862	0.415222	-0.14781	0.061199
shopOnline	0.252387	0.100155	2.519976	18.69217	0.021007	0.042527	0.462247
shopOther outlets (eg specialist or independent stores)	-0.2334	0.125139	-1.86511	364.597	0.062969	-0.47948	0.012687
FHS_presenceNo:genderMale	-0.22429	0.144646	-1.55063	58.35114	0.126398	-0.51379	0.065211

Table 14: Weekly groceries costs of non-FHS households compared to FHS households where the main person living with FHS is in the CD group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	5.259594	0.430271	12.2239	16.00984	1.56E-09	4.347505	6.171683
FHS_presenceNo	-0.11527	0.038216	-3.0163	211.2222	2.87E-03	-0.19061	-0.03994
hh_sizeMedium HH	-0.11717	0.070355	-1.66534	52.41203	1.02E-01	-0.25832	0.023986
hh_sizeSingle HH	-0.70944	0.06477	-10.9531	465.6938	0.00E+00	-0.83671	-0.58216

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
hh_sizeSmall HH	-0.40429	0.057697	-7.00718	198.3157	3.71E-11	-0.51807	-0.29051
hh_incomeLow	-0.15602	0.056844	-2.74464	37.60566	9.23E-03	-0.27113	-0.0409
hh_incomeMedium	-0.08746	0.055149	-1.58595	27.66971	1.24E-01	-0.20049	0.025565
hh_incomeVery High	0.165892	0.055251	3.002543	316.5425	2.89E-03	0.057187	0.274597
region-Northern Ireland	0.056096	0.074722	0.750729	58.39292	4.56E-01	-0.09345	0.205646
region-Wales	-0.04469	0.061283	-0.7292	51.91265	4.69E-01	-0.16766	0.07829
gender-Male	0.042986	0.051065	0.841787	369.0346	4.00E-01	-0.05743	0.1434
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.00197	0.041532	-0.04741	32.90033	9.62E-01	-0.08648	0.082539
educationNo qualifications	-0.11337	0.084989	-1.33395	50.48049	1.88E-01	-0.28404	0.057294
age20-29	-0.59204	0.375227	-1.57781	23.62608	1.28E-01	-1.36712	0.183041
age30-39	-0.53901	0.363624	-1.48233	28.50838	1.49E-01	-1.28326	0.205242

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
age40-49	-0.55152	0.362524	-1.52132	28.76564	1.39E-01	-1.29322	0.190191
age50-59	-0.50746	0.368074	-1.37868	25.75029	1.80E-01	-1.2644	0.249487
age60-69	-0.49554	0.369387	-1.34151	25.38166	1.92E-01	-1.25573	0.26465
age70-79	-0.52998	0.373911	-1.41739	24.17483	1.69E-01	-1.3014	0.241443
age80+	-0.59239	0.382918	-1.54704	32.41489	1.32E-01	-1.37198	0.187197
ethnici-tyOther	0.296061	0.318076	0.930787	654.5724	3.52E-01	-0.32851	0.920633
ethnici-tyWhite	0.120973	0.116348	1.039748	36.11513	3.05E-01	-0.11497	0.356912
Geogra-phyUrban	-0.03349	0.038079	-0.87939	103.3388	3.81E-01	-0.109	0.042031
shopOnlin e	0.269397	0.070849	3.802409	475.4947	1.62E-04	0.130181	0.408614
shopOthe r outlets (eg spe-cialist or independ-ent stores)	-0.09946	0.109906	-0.90492	245.8128	3.66E-01	-0.31593	0.117022
FHS_pres-en-ceNo:gen-derMale	0.010755	0.081039	0.132709	38.00518	8.95E-01	-0.1533	0.174809

Table 15: Weekly groceries costs of non-FHS households compared to FHS households where the main person living with FHS is in the FA group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	5.129437	0.323473	15.85741	21.30586	2.84E-13	4.457327	5.801548
FHS_presenceNo	-0.11834	0.058274	-2.03068	33.60846	5.03E-02	-0.23681	0.000142
hh_sizeMedium HH	-0.04827	0.081731	-0.59061	111.0326	5.56E-01	-0.21023	0.113683
hh_sizeSingle HH	-0.68703	0.091799	-7.484	151.7663	5.44E-12	-0.8684	-0.50566
hh_sizeSmall HH	-0.30308	0.073113	-4.14537	115.9194	6.48E-05	-0.44789	-0.15827
hh_incomeLow	-0.2765	0.087507	-3.15972	20.53852	4.82E-03	-0.45873	-0.09427
hh_incomeMedium	-0.15298	0.065524	-2.33474	62.95204	2.28E-02	-0.28392	-0.02204
hh_incomeVery High	0.096047	0.074685	1.286025	42.71925	2.05E-01	-0.0546	0.246692
regionNorthern Ireland	0.064529	0.10542	0.612111	164.9424	5.41E-01	-0.14362	0.272676
regionWales	-0.04802	0.085658	-0.56061	34.95463	5.79E-01	-0.22192	0.125883

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
genderMale	0.088806	0.082479	1.076719	63.07907	2.86E-01	-0.07601	0.253622
genderother	0.021039	NA	NA	NA	NA	NA	NA
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.014214	0.067078	0.211898	32.40814	8.34E-01	-0.12235	0.150781
educationNo qualifications	-0.10476	0.167323	-0.62608	110.2551	5.33E-01	-0.43634	0.226829
age20-29	-0.3609	0.287652	-1.25466	32.28921	2.19E-01	-0.94663	0.224817
age30-39	-0.32229	0.282867	-1.13938	40.84839	2.61E-01	-0.89362	0.249033
age40-49	-0.3199	0.280735	-1.13949	41.70771	2.61E-01	-0.88656	0.246768
age50-59	-0.23895	0.278337	-0.85847	48.15486	3.95E-01	-0.79853	0.320642
age60-69	-0.32705	0.271878	-1.20293	65.2201	2.33E-01	-0.86999	0.215894
age70-79	-0.14597	0.28306	-0.51569	53.03756	6.08E-01	-0.71371	0.421767
age80+	-0.35454	0.334747	-1.05912	46.50355	2.95E-01	-1.02815	0.319075

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
ethnicityOther	0.200255	0.279117	0.71746	307.4571	4.74E-01	-0.34897	0.749476
ethnicityWhite	0.051162	0.105301	0.485866	29.38305	6.31E-01	-0.16408	0.266404
GeographyUrban	-0.07113	0.049511	-1.43667	228.6695	1.52E-01	-0.16869	0.026425
shopOnline	0.220932	0.104157	2.121147	16.90184	4.90E-02	0.001083	0.440781
shopOther outlets (eg specialist or independent stores)	0.196093	0.160215	1.223941	65.80876	2.25E-01	-0.1238	0.515989
FHS_presenceNo:gender-Male	-0.06306	0.126297	-0.49926	26.92887	6.22E-01	-0.32223	0.196116
FHS_presenceNo:gen-derother	-1.06979	NA	NA	NA	NA	NA	NA

Table 16: Weekly eating out / takeaway costs of non-FHS households compared to FHS households where the main person living with FHS is in the FIO group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	3.59E+00	0.679679	5.28E+00	35.41197	6.59E-06	2.211912	4.970407
FHS_presenceNo	-1.59E-01	0.079726	-2.00E+00	124.7574	4.78E-02	-0.31712	-0.00154
hh_sizeMedium HH	-1.21E-01	0.161732	-7.49E-01	30.01504	4.60E-01	-0.45145	0.20914

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
hh_sizeSingle HH	-3.94E-01	0.187405	-2.10E+00	25.69889	4.53E-02	-0.77968	-0.0088
hh_sizeSmall HH	-2.01E-01	0.148903	-1.35E+00	27.09271	1.88E-01	-0.50646	0.104492
hh_incomeLow	-5.76E-01	0.197126	-2.92E+00	8.691635	1.76E-02	-1.0243	-0.12759
hh_incomeMedium	-2.54E-01	0.10227	-2.48E+00	94.0925	1.48E-02	-0.45711	-0.051
hh_incomeVery High	1.62E-01	0.138993	1.16E+00	26.79308	2.55E-01	-0.12376	0.446827
regionNorthern Ireland	-1.46E-01	0.171418	-8.51E-01	56.09866	3.98E-01	-0.48923	0.197528
regionWales	-2.56E-01	0.219632	-1.17E+00	53.53595	2.48E-01	-0.69683	0.184017
genderMale	2.50E-02	0.137131	1.82E-01	335.5594	8.56E-01	-0.24478	0.294705
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	3.24E-02	0.100846	3.22E-01	35.29717	7.50E-01	-0.17222	0.237114
educationNo qualifications	-1.34E-01	0.576946	-2.32E-01	5.6641	8.24E-01	-1.56632	1.298244
age20-29	-9.02E-02	0.508883	-1.77E-01	203.2688	8.59E-01	-1.0936	0.913134
age30-39	-1.42E-01	0.500761	-2.84E-01	263.2088	7.77E-01	-1.12808	0.843933
age40-49	1.15E-02	0.495106	2.31E-02	283.0829	9.82E-01	-0.96311	0.986006
age50-59	6.94E-02	0.495763	1.40E-01	271.441	8.89E-01	-0.90663	1.045433
age60-69	4.74E-03	0.510658	9.28E-03	203.8805	9.93E-01	-1.00211	1.011588
age70-79	2.33E-01	0.519142	4.48E-01	198.4995	6.55E-01	-0.79111	1.256368
age80+	-3.72E-01	0.542479	-6.85E-01	264.5122	4.94E-01	-1.4398	0.696451
ethnicityOther	4.25E-01	0.528885	8.03E-01	22.40002	4.30E-01	-0.6709	1.520517

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
ethnicityWhite	2.16E-01	0.190411	1.13E+00	16.64267	2.74E-01	-0.18681	0.617968
GeographyUrban	3.36E-02	0.101432	3.31E-01	25.96935	7.43E-01	-0.17494	0.242079
freq_eota5-6 times a week	-4.15E-05	0.693876	-5.98E-05	38.28999	1.00E+00	-1.40437	1.404287
freq_eotaAt least once a day	-6.22E-01	0.48975	-1.27E+00	34.54507	2.12E-01	-1.61709	0.372336
freq_eotaLess than once a month	-1.65E+00	0.384076	-4.29E+00	15.7557	5.80E-04	-2.46302	-0.83256
freq_eotaNever	-2.72E+00	0.470311	-5.79E+00	10.99858	1.21E-04	-3.75922	-1.68889
freq_eotaOnce a fortnight	-7.66E-01	0.359894	-2.13E+00	19.78363	4.61E-02	-1.5173	-0.0148
freq_eotaOnce a month	-1.14E+00	0.348807	-3.28E+00	26.02966	2.99E-03	-1.85931	-0.42543
freq_eotaOnce or twice a week	-4.27E-01	0.352861	-1.21E+00	21.50158	2.39E-01	-1.16003	0.305514
FHS_presenceNo:gender-Male	1.16E-01	0.25086	4.64E-01	18.02804	6.49E-01	-0.41069	0.643265

Table 17: Weekly eating out / takeaway costs of non-FHS households compared to FHS households where the main person living with FHS is in the CD group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	3.300807	0.486712	6.781848	93.53685	1.06E-09	2.334367	4.267248
FHS_presenceNo	-0.19945	0.068134	-2.92726	79.77393	4.45E-03	-0.33504	-0.06385
hh_sizeMedium HH	-0.06695	0.134757	-0.4968	21.7128	6.24E-01	-0.34663	0.212737
hh_sizeSingle HH	-0.38781	0.12612	-3.07494	46.75912	3.51E-03	-0.64157	-0.13406
hh_sizeSmall HH	-0.09969	0.126424	-0.78853	17.20044	4.41E-01	-0.36618	0.166806
hh_incomeLow	-0.40734	0.103988	-3.91719	24.63619	6.26E-04	-0.62167	-0.19301
hh_incomeMedium	-0.17627	0.088485	-1.99215	44.69772	5.25E-02	-0.35453	0.001976
hh_incomeVery High	0.214769	0.102036	2.104834	72.17581	3.88E-02	0.011372	0.418166

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
regionNorthern Ireland	-0.04132	0.125322	-0.32971	71.6875	7.43E-01	-0.29116	0.208524
regionWales	-0.01406	0.127287	-0.11044	13.40284	9.14E-01	-0.28821	0.260091
genderMale	-0.02802	0.098765	-0.28372	40.52179	7.78E-01	-0.22755	0.17151
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.08347	0.07004	-1.1918	30.47848	2.43E-01	-0.22642	0.059473
educationNo qualifications	0.005052	0.152561	0.033115	26.18221	9.74E-01	-0.30844	0.31854
age20-29	0.213282	0.428621	0.497601	53.57566	6.21E-01	-0.64621	1.072771
age30-39	0.239312	0.448634	0.533423	34.43569	5.97E-01	-0.672	1.150621
age40-49	0.332096	0.414807	0.800603	72.0357	4.26E-01	-0.4948	1.158991
age50-59	0.315336	0.407104	0.774585	88.73359	4.41E-01	-0.4936	1.124276
age60-69	0.372279	0.439089	0.847844	39.95758	4.02E-01	-0.51518	1.259741
age70-79	0.261921	0.443232	0.590934	39.46329	5.58E-01	-0.63426	1.158106
age80+	0.150417	0.458141	0.328319	83.95786	7.43E-01	-0.76065	1.061488
ethnicityOther	0.098829	0.588125	0.168041	33.00482	8.68E-01	-1.09771	1.295371
ethnicityWhite	-0.07794	0.178882	-0.4357	184.4933	6.64E-01	-0.43086	0.274979
GeographyUrban	0.068897	0.062499	1.102361	148.1886	2.72E-01	-0.05461	0.192401
freq_eota5-6 times a week	0.73488	0.648463	1.133263	698.6357	2.57E-01	-0.53829	2.00805
freq_eotaAt least once a day	-0.27974	0.32383	-0.86386	628.4996	3.88E-01	-0.91566	0.356177
freq_eotaLess than once a month	-1.43637	0.179173	-8.01663	433.0507	1.02E-14	-1.78852	-1.08421
freq_eotaNever	-2.19034	0.205105	-10.6791	460.9722	0.00E+00	-2.5934	-1.78728
freq_eotaOnce a fortnight	-0.56298	0.183148	-3.07389	284.8307	2.32E-03	-0.92347	-0.20248
freq_eotaOnce a month	-0.91147	0.186873	-4.87751	216.0028	2.08E-06	-1.2798	-0.54315
freq_eotaOnce or twice a week	-0.12347	0.176736	-0.69862	517.2663	4.85E-01	-0.47068	0.223737

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
FHS_presenceNo:gender-Male	0.231012	0.124872	1.849989	91.88066	6.75E-02	-0.017	0.479022

Table 18: Weekly eating out / takeaway costs of non-FHS households compared to FHS households where the main person living with FHS is in the FA group using a generalised linear regression model of Gamma family with log link

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
(Intercept)	3.584468	0.516739	6.936714	128.3309	1.77E-10	2.562037	4.606898
FHS_presenceNo	-0.22771	0.072996	-3.11941	107.3638	2.33E-03	-0.37241	-0.083
hh_sizeMedium HH	-0.10868	0.167941	-0.64715	18.42393	5.26E-01	-0.46093	0.243566
hh_sizeSingle HH	-0.23354	0.168094	-1.38933	39.49041	1.73E-01	-0.57341	0.106329
hh_sizeSmall HH	-0.03374	0.128399	-0.26277	59.75193	7.94E-01	-0.2906	0.223118
hh_incomeLow	-0.41506	0.176424	-2.35264	10.05098	4.03E-02	-0.80789	-0.02224
hh_incomeMedium	-0.20828	0.116197	-1.79249	26.67477	8.44E-02	-0.44684	0.030271
hh_incomeVery High	0.016889	0.135507	0.124636	22.40431	9.02E-01	-0.26384	0.297619
regionNorthern Ireland	0.071971	0.221528	0.324885	13.31945	7.50E-01	-0.40545	0.549389
regionWales	-0.01033	0.124236	-0.08312	82.29738	9.34E-01	-0.25746	0.236805
genderMale	0.18549	0.090718	2.04469	112.3861	4.32E-02	0.005751	0.365229

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.13086	0.096496	-1.35614	62.68636	1.80E-01	-0.32371	0.061989
educationNo qualifica-tions	-0.18692	0.29634	-0.63076	64.85847	5.30E-01	-0.77878	0.404938
age20-29	0.281568	0.47063	0.598279	76.25438	5.51E-01	-0.65572	1.218859
age30-39	0.369887	0.494691	0.747713	48.41075	4.58E-01	-0.62454	1.364312
age40-49	0.400888	0.496204	0.807911	46.29224	4.23E-01	-0.59775	1.399524
age50-59	0.402476	0.493542	0.815485	51.06104	4.19E-01	-0.58832	1.393274
age60-69	0.411047	0.486364	0.845143	61.42567	4.01E-01	-0.56136	1.383455
age70-79	0.272828	0.46893	0.581808	129.9536	5.62E-01	-0.6549	1.200553
age80+	0.191425	0.536499	0.356803	135.9921	7.22E-01	-0.86954	1.252385
ethnicityOther	0.455281	0.449275	1.013368	266.4136	3.12E-01	-0.4293	1.339863
ethnicityWhite	-0.00189	0.172687	-0.01094	50.05751	9.91E-01	-0.34873	0.344952
GeographyUrban	0.007016	0.08167	0.085911	201.1876	9.32E-01	-0.15402	0.168055
freq_eota5-6 times a week	0.340325	0.597786	0.56931	41.03752	5.72E-01	-0.86689	1.547544
freq_eotaAt least once a day	-0.67884	0.478597	-1.41839	40.31641	1.64E-01	-1.64588	0.288206

term	estimate	std.error	statistic	df	p.value	2.50%	97.50%
freq_eotaLess than once a month	-1.70679	0.311274	-5.48324	10.25453	2.45E-04	-2.39802	-1.01556
freq_eotaNever	-2.87007	0.260609	-11.0129	35.78481	4.80E-13	-3.39872	-2.34142
freq_eotaOnce a fort-night	-0.9315	0.263882	-3.53	16.2218	2.73E-03	-1.49029	-0.37272
freq_eotaOnce a month	-1.23161	0.315331	-3.90575	9.922259	2.98E-03	-1.93495	-0.52826
freq_eotaOnce or twice a week	-0.51973	0.293671	-1.76976	11.02122	1.04E-01	-1.16594	0.126487

Multiple Imputation

Table 19: Weekly food diary costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 10 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	6.648214***	5.146786***	5.705603***
FHS_presenceNo	-0.2215**	-0.16277**	-0.21105
hh_sizeMedium HH	0.069563	-0.27795*	-0.13958
hh_sizeSingle HH	-0.23622	-0.76435***	-0.50211**
hh_sizeSmall HH	-0.14395	-0.50684***	-0.22592
hh_incomeLow	-0.39131**	-0.22838	-0.27615
hh_incomeMedium	-0.24085	-0.14615	-0.22854
hh_incomeVery High	0.019633	0.050341	-0.1095
regionNorthern Ireland	-0.03994	0.087464	0.265502
regionWales	-1.31366	-0.04795	-0.03216
genderMale	0.142764	0.000864	0.15512
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.010739	0.049786	0.024709
educationNo qualifications	1.425514	-0.09993	-0.37331
age20-29	-1.94227	-0.20207	-1.01784
age30-39	-1.79969	-0.09634	-0.65722
age40-49	-1.87839	-0.06469	-0.90898
age50-59	-2.0758	-0.06167	-0.90039

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age60-69	-1.94833	-0.07092	-1.04717
age70-79	-2.20243	0.064477	-0.79814
age80+	-2.20411	-0.3816	-1.2403
ethnicityOther	NA	-0.24668	0.640663
ethnicityWhite	0.125592	-0.05169	0.079526
GeographyUrban	0.000397	-0.03492	-0.08431
shopOnline	0.114054	0.229679	0.086416
shopOther outlets (eg specialist of independent stores)	-0.07061	0.136851	0.010324

P<0.05*,p<0.01**,p<0.001***

Table 20: Weekly food diary costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 20 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	6.145917***	5.295531***	5.475559***
FHS_presenceNo	-0.21559**	-0.15101**	-0.18071
hh_sizeMedium HH	0.070708	-0.298**	-0.1512
hh_sizeSingle HH	-0.22601	-0.77872***	-0.49188*
hh_sizeSmall HH	-0.15281	-0.52713***	-0.24014
hh_incomeLow	-0.38571**	-0.20027*	-0.30875
hh_incomeMedium	-0.21277	-0.09765	-0.2583*

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
hh_incomeVery High	0.0453	0.087404	-0.13651
regionNorthern Ireland	0.014845	0.100568	0.297491
regionWales	-0.82463	-0.04573	-0.00389
genderMale	0.163719	0.014421	0.136763
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.00277	0.044637	0.006709
educationNo qualifications	0.868141	-0.06525	-0.12395
age20-29	-1.43714	-0.39055	-0.74194
age30-39	-1.29349	-0.25318	-0.51827
age40-49	-1.38669	-0.24992	-0.73678
age50-59	-1.53287	-0.2579	-0.70118
age60-69	-1.42408	-0.24075	-0.85383
age70-79	-1.66231	-0.15394	-0.62908
age80+	-1.67057	-0.55674	-1.11342
ethnicityOther	NA	-0.22039	0.713707
ethnicityWhite	0.115248	-0.02333	0.149525
GeographyUrban	-0.01994	-0.05282	-0.04817
shopOnline	0.108392	0.204165	0.070967
shopOther outlets (for example, specialist of independent stores)	-0.07666	0.104405	-0.00822

P<0.05*,p<0.01**,p<0.001***

Table 21: Weekly food diary costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 40 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	6.182751***	5.261097***	5.36833***
FHS_presenceNo	-0.22894**	-0.14556**	-0.1679
hh_sizeMedium HH	0.078278	-0.30618***	-0.17688*
hh_sizeSingle HH	-0.24254	-0.7783***	-0.47809
hh_sizeSmall HH	-0.15698	-0.52342***	-0.224*
hh_incomeLow	-0.39382	-0.19274	-0.30398*
hh_incomeMedium	-0.22484	-0.10868	-0.26631
hh_incomeVery High	0.03207	0.087462	-0.15342
regionNorthern Ireland	0.031176	0.119541	0.293324
regionWales	-0.83632	-0.06569	-0.02288
genderMale	0.132849	0.020697	0.141632
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.01006	0.042616	0.025944
educationNo qualifications	0.892249	-0.06653	-0.18609
age20-29	-1.55404	-0.32619	-0.76941
age30-39	-1.37897	-0.19742	-0.44558
age40-49	-1.4509	-0.18648	-0.66555
age50-59	-1.59916	-0.19391	-0.62689

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age60-69	-1.50017	-0.18335	-0.8299
age70-79	-1.69962	-0.09636	-0.56698
age80+	-1.74073	-0.49397	-1.05622
ethnicityOther	-0.11113	-0.24183	0.713571
ethnicityWhite	0.154884	-0.05849	0.161187
GeographyUrban	-0.01178	-0.04199	-0.03492
shopOnline	0.098485	0.22024	0.079891
shopOther outlets (eg specialist of in-dependent stores)	-0.05215	0.129462	-0.01884

P<0.05*,p<0.01**,p<0.001***

Table 22: Weekly food diary costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 100 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	6.001604***	5.210377***	5.575027***
FHS_presenceNo	-0.21932**	-0.14897**	-0.18493*
hh_sizeMedium HH	0.076672	-0.29507**	-0.15272
hh_sizeSingle HH	-0.26405	-0.77191***	-0.46286*
hh_sizeSmall HH	-0.15938	-0.52335***	-0.2143
hh_incomeLow	-0.37478**	-0.20495*	-0.31197*
hh_incomeMedium	-0.21423	-0.11323	-0.27035*

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
hh_incomeVery High	0.042562	0.080456	-0.14478
regionNorthern Ireland	0.022874	0.119529	0.255238
regionWales	-0.67688	-0.06709	-0.01679
genderMale	0.134323	0.018007	0.147502
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.009848	0.038248	0.017033
educationNo qualifications	0.765808	-0.0786	-0.18142
age20-29	-1.36484	-0.29926	-0.88437
age30-39	-1.20312	-0.17121	-0.62123
age40-49	-1.29641	-0.15573	-0.84791
age50-59	-1.42855	-0.16129	-0.7944
age60-69	-1.3292	-0.15497	-0.97984
age70-79	-1.57384	-0.05924	-0.73644
age80+	-1.56542	-0.44598	-1.23354
ethnicityOther	NA	-0.2306	0.709828
ethnicityWhite	0.157647	-0.0339	0.129133
GeographyUrban	-0.00901	-0.03512	-0.04049
shopOnline	0.108436	0.224654	0.074275
shopOther outlets (eg specialist of independent stores)	-0.06075	0.122117	0.03182

P<0.05*,p<0.01**,p<0.001***

Table 23: Weekly groceries costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 10 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	5.067859***	5.112172***	5.378116***
FHS_presenceNo	-0.1488**	-0.11295***	-0.13645**
hh_sizeMedium HH	-0.03805	-0.14086*	-0.02322
hh_sizeSingle HH	-0.50735***	-0.73277***	-0.64791***
hh_sizeSmall HH	-0.27167**	-0.42087***	-0.28215***
hh_incomeLow	-0.34711**	-0.16734**	-0.28888***
hh_incomeMedium	-0.17333*	-0.10603*	-0.16252*
hh_incomeVery High	0.146864	0.164025**	0.083359
regionNorthern Ireland	-0.11915	0.06299	0.039268
regionWales	-0.17491	-0.06437	-0.05851
genderMale	0.117975	0.055296	0.087278
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.05309	-0.0072	0.026515
educationNo qualifications	-0.15561	-0.08892	-0.08018
age20-29	-0.334	-0.41793	-0.65145
age30-39	-0.33818	-0.34458	-0.60854
age40-49	-0.3431	-0.36083	-0.58402
age50-59	-0.34197	-0.32478	-0.54751

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age60-69	-0.39426	-0.3155	-0.62803
age70-79	-0.32832	-0.33885	-0.43805
age80+	-0.41345	-0.39122	-0.65175
ethnicityOther	0.421061	0.283783	0.24038
ethnicityWhite	0.167037	0.104692	0.082996
GeographyUrban	-0.02797	-0.0338	-0.08346
shopOnline	0.230566**	0.274628***	0.203996*
shopOther – specialist / independent	-0.3091*	-0.10709	0.152963

Table 24: Weekly groceries costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 20 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	5.124058***	5.0818***	5.182471***
FHS_presenceNo	-0.14665**	-0.12076***	-0.13086**
hh_sizeMedium HH	-0.02076	-0.13114*	-0.03588
hh_sizeSingle HH	-0.51206***	-0.72861***	-0.65942***
hh_sizeSmall HH	-0.25879**	-0.41345***	-0.30432***
hh_incomeLow	-0.28816***	-0.17621**	-0.31338***
hh_incomeMedium	-0.1638*	-0.11102*	-0.17025*
hh_incomeVery High	0.170735*	0.159489**	0.079258

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
regionNorthern Ireland	-0.04471	0.055472	0.080832
regionWales	-0.15642	-0.05135	-0.05006
genderMale	0.104688	0.045404	0.081909
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.05178	-0.00332	0.013071
educationNo qualifications	-0.16078	-0.08403	-0.14852
age20-29	-0.41132	-0.3476	-0.41713
age30-39	-0.39563	-0.28735	-0.38511
age40-49	-0.41157	-0.29048	-0.38398
age50-59	-0.40455	-0.26434	-0.31142
age60-69	-0.48222	-0.2555	-0.39628
age70-79	-0.36816	-0.27401	-0.19782
age80+	-0.46784	-0.30166	-0.42423
ethnicityOther	0.440761	0.328462	0.211266
ethnicityWhite	0.154622	0.073856	0.080178
GeographyUrban	-0.04141	-0.03351	-0.0751
shopOnline	0.240438**	0.270926***	0.224994**
shopOther – specialist / independent	-0.29631*	-0.11979	0.154666

P<0.05*,p<0.01**,p<0.001***

Table 25: Weekly groceries costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 40 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	5.110314***	5.054849***	5.237581***
FHS_presenceNo	-0.14989**	-0.11924***	-0.13068**
hh_sizeMedium HH	-0.02412	-0.12765*	-0.02837
hh_sizeSingle HH	-0.50147***	-0.72584***	-0.66424***
hh_sizeSmall HH	-0.24992**	-0.40761***	-0.2956***
hh_incomeLow	-0.33091***	-0.16677**	-0.30344***
hh_incomeMedium	-0.18972**	-0.10311*	-0.15921*
hh_incomeVery High	0.156755	0.15993**	0.081655
regionNorthern Ireland	-0.05413	0.060904	0.083765
regionWales	-0.1606	-0.05994	-0.05692
genderMale	0.11471	0.049495	0.078962
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.05236	-0.00196	0.015669
educationNo qualifications	-0.1419	-0.09147	-0.13474
age20-29	-0.38228	-0.36258	-0.48342
age30-39	-0.35989	-0.29836	-0.43656
age40-49	-0.38336	-0.3018	-0.4343
age50-59	-0.37365	-0.27468	-0.35479
age60-69	-0.44887	-0.2675	-0.45536

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age70-79	-0.34197	-0.28333	-0.25297
age80+	-0.45487	-0.32458	-0.48236
ethnicityOther	0.42703	0.330281	0.192215
ethnicityWhite	0.153916	0.096127	0.065583
GeographyUrban	-0.04518	-0.02826	-0.07537
shopOnline	0.250016**	0.277328***	0.224293**
shopOther – specialist / independent	-0.28375	-0.10711	0.1555

P<0.05*,p<0.01**,p<0.001***

Table 26: Weekly groceries costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 100 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	5.08729***	5.054849***	5.227387***
FHS_presenceNo	-0.14963**	-0.11924***	-0.12662**
hh_sizeMedium HH	-0.02271	-0.12765*	-0.03017
hh_sizeSingle HH	-0.5122***	-0.72584***	-0.67324***
hh_sizeSmall HH	-0.25556**	-0.40761***	-0.29773***
hh_incomeLow	-0.30856***	-0.16677**	-0.30156***
hh_incomeMedium	-0.17094**	-0.10311*	-0.15706*
hh_incomeVery High	0.171055*	0.15993**	0.072693
regionNorthern Ireland	-0.05169	0.060904	0.085886

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
regionWales	-0.15235	-0.05994	-0.05162
genderMale	0.108395	0.049495	0.079967
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.04836	-0.00196	0.013608
educationNo qualifications	-0.13782	-0.09147	-0.13378
age20-29	-0.37716	-0.36258	-0.47306
age30-39	-0.36313	-0.29836	-0.4293
age40-49	-0.37903	-0.3018	-0.42457
age50-59	-0.36709	-0.27468	-0.35405
age60-69	-0.44366	-0.2675	-0.45266
age70-79	-0.33976	-0.28333	-0.25053
age80+	-0.43938	-0.32458	-0.47195
ethnicityOther	0.445705	0.330281	0.198923
ethnicityWhite	0.160357	0.096127	0.078115
GeographyUrban	-0.04501	-0.02826	-0.07889
shopOnline	0.244009**	0.277328***	0.217943**
shopOther – specialist / independent	-0.27993*	-0.10711	0.143969

P<0.05*,p<0.01**,p<0.001***

Table 27: Weekly eating out / takeaway costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 10 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	3.66304***	3.259814023***	3.32874518***
FHS_presenceNo	-0.12589	-0.11946476*	-0.22659837**
hh_sizeMedium HH	-0.10622*	-0.07447139	-0.1593793
hh_sizeSingle HH	-0.39155	-0.35453572***	-0.31984982
hh_sizeSmall HH	-0.17389***	-0.08563413	-0.10776493
hh_incomeLow	-0.51974	-0.38198123***	-0.38443345**
hh_incomeMedium	-0.20856	-0.19597504*	-0.21276889
hh_incomeVery High	0.196871	0.218418888*	0.03535022
regionNorthern Ireland	-0.14428	-0.03652669	0.03143293
regionWales	-0.20053	-0.03189701	-0.04529779
genderMale	0.060267	0.083407579	0.15654715
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.049272	-0.07856215	-0.13888782
educationNo qualifications	0.26707	-0.00996312	-0.1354737
age20-29	-0.0702	0.241698145	0.49783179
age30-39	-0.09869	0.334745722	0.60708268
age40-49	0.005052	0.382016632	0.58583002
age50-59	0.102701	0.398419537	0.56904348

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age60-69	0.00332	0.429628654	0.60707677
age70-79	0.179684	0.3316659	0.49632364
age80+	-0.40472	0.212166241	0.42348179
ethnicityOther	0.604715	0.024326385	0.47737972
ethnicityWhite	0.166159	-0.11623268	0.03903686
GeographyUrban	0.048538	0.087924641	0.02431814
freq_eota5-6 times a week	-0.13314	0.555533861	0.41016702
freq_eotaAt least once a day	-0.7599	-0.25248478	-0.56243123
freq_eotaLess than once a month	-1.77806***	-1.51592603***	-1.64630997***
freq_eotaNever	-2.85516***	-2.34535434***	-2.73255753***
freq_eotaOnce a fortnight	-0.88471**	-0.62384819**	-0.81617312**
freq_eotaOnce a month	-1.26851***	-0.96123048***	-1.19633683***
freq_eotaOnce or twice a week	-0.56338	-0.20326872	-0.4713258

P<0.05*,p<0.01**,p<0.001***

Table 28: Weekly eating out / takeaway costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 20 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	3.581344***	3.237909***	3.250998***
FHS_presenceNo	-0.1158	-0.12371*	-0.21934**
hh_sizeMedium HH	-0.11068	-0.0555	-0.14225
hh_sizeSingle HH	-0.42961*	-0.33047**	-0.31026
hh_sizeSmall HH	-0.21771	-0.07866	-0.08184**
hh_incomeLow	-0.52691***	-0.39378***	-0.38603*
hh_incomeMedium	-0.1989	-0.18922*	-0.23918
hh_incomeVery High	0.214745	0.216462*	0.006083
regionNorthern Ireland	-0.1383	-0.04986	0.011139
regionWales	-0.2129	-0.0265	0.009369
genderMale	0.055108	0.102559	0.134361
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.075178	-0.09486	-0.13301
educationNo qualifications	0.261518	-0.03144	-0.14249
age20-29	-0.08106	0.282272	0.615091
age30-39	-0.10178	0.362857	0.715293
age40-49	-0.00045	0.436254	0.719476
age50-59	0.097127	0.434328	0.712255

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
age60-69	-0.0024	0.481991	0.718254
age70-79	0.237866	0.372602	0.59955
age80+	-0.38664	0.243394	0.561061
ethnicityOther	0.650966	0.026331	0.46136
ethnicityWhite	0.208914	-0.13214	0.033097
GeographyUrban	0.054183	0.07716	0.020271
freq_eota5-6 times a week	-0.0889	0.555323	0.313649
freq_eotaAt least once a day	-0.67309	-0.2153	-0.67654
freq_eotaLess than once a month	-1.74604***	-1.49062***	-1.68872***
freq_eotaNever	-2.8148***	-2.39348***	-2.74332***
freq_eotaOnce a fortnight	-0.83193*	-0.6141**	-0.85351***
freq_eotaOnce a month	-1.24183***	-0.95368***	-1.24874***
freq_eotaOnce or twice a week	-0.52487	-0.19983	-0.51091*

P<0.05*,p<0.01**,p<0.001***

Table 29: Weekly eating out / takeaway costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 40 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	3.640821***	3.230703***	3.38081***
FHS_presenceNo	-0.11157	-0.11699*	-0.22794**

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
hh_sizeMedium HH	-0.11133	-0.05473	-0.1305
hh_sizeSingle HH	-0.40889*	-0.35611***	-0.27402
hh_sizeSmall HH	-0.20735	-0.09226	-0.064
hh_incomeLow	-0.53064***	-0.37801***	-0.41871**
hh_incomeMedium	-0.22728*	-0.18327*	-0.25514*
hh_incomeVery High	0.193071	0.227275*	-0.01458
regionNorthern Ireland	-0.12187	-0.05005	0.055524
regionWales	-0.21031	-0.02451	-0.0032
genderMale	0.049154	0.091168	0.149843
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.056538	-0.08226	-0.11504
educationNo qualifications	0.182171	-0.00577	-0.14888
age20-29	-0.10413	0.289036	0.474421
age30-39	-0.10143	0.340502	0.557445
age40-49	-0.01042	0.433516	0.582006
age50-59	0.083752	0.418918	0.557277
age60-69	0.003197	0.473915	0.571817
age70-79	0.193952	0.372725	0.456445
age80+	-0.4217	0.255399	0.364904
ethnicityOther	0.673008	0.072663	0.466911

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
ethnicityWhite	0.20438	-0.1369	0.016585
GeographyUrban	0.055467	0.079323	0.014344
freq_eota5-6 times a week	-0.06164	0.446672	0.374883
freq_eotaAt least once a day	-0.6977	-0.22225	-0.68954
freq_eotaLess than once a month	-1.76824***	-1.48463***	-1.67078***
freq_eotaNever	-2.86003***	-2.34546***	-2.75221***
freq_eotaOnce a fortnight	-0.84727**	-0.60365**	-0.82876***
freq_eotaOnce a month	-1.25055***	-0.94617***	-1.22267***
freq_eotaOnce or twice a week	-0.55083	-0.18133	-0.49953*

P<0.05*,p<0.01**,p<0.001***

Table 30: Weekly eating out / takeaway costs of non-FHS households compared to FHS households broken down by FHS group using a generalised linear regression model of Gamma family with log link and with 100 multiple imputations to impute missing data

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
(Intercept)	3.628912***	3.274841***	3.374477***
FHS_presenceNo	-0.10554	-0.12241*	-0.23301**
hh_sizeMedium HH	-0.10765	-0.07983	-0.13713
hh_sizeSingle HH	-0.39064*	-0.35589**	-0.30258
hh_sizeSmall HH	-0.19554	-0.10263	-0.07315
hh_incomeLow	-0.55296***	-0.39359***	-0.40676**

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
hh_incomeMedium	-0.22859*	-0.18977*	-0.22683*
hh_incomeVery High	0.18829	0.223622*	0.029952
regionNorthern Ireland	-0.10401	-0.04688	0.043077
regionWales	-0.21783	-0.02121	-0.01531
genderMale	0.043515	0.084492	0.127394
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	0.054787	-0.08503	-0.10572
educationNo qualifications	0.223264	-0.01516	-0.09843
age20-29	-0.10981	0.263962	0.489203
age30-39	-0.1041	0.339979	0.569471
age40-49	-0.00702	0.41437	0.574988
age50-59	0.080267	0.402538	0.565374
age60-69	-0.00227	0.454705	0.573722
age70-79	0.2084	0.360048	0.475057
age80+	-0.41459	0.239962	0.382459
ethnicityOther	0.627777	0.066532	0.469741
ethnicityWhite	0.213788	-0.13932	0.002753
GeographyUrban	0.055878	0.074042	0.017329
freq_eota5-6 times a week	-0.10753	-0.23753	0.352781
freq_eotaAt least once a day	-0.73033	-1.48318***	-0.66467

Dependent variable	Comparison with FIO	Comparison with CD	Comparison with FA
freq_eotaLess than once a month	-1.75294***	-2.34714***	-1.67264***
freq_eotaNever	-2.85004***	-0.60797**	-2.74897***
freq_eotaOnce a fortnight	-0.85822*	-0.94799***	-0.82974***
freq_eotaOnce a month	-1.24937***	-0.18472	-1.2195***
freq_eotaOnce or twice a week	-0.54224	0.552997	-0.49692*
N	• 376 obvs (188 from each group) • 50 unmatched from FIO	• 770 obvs (385 from each group) • 266 un-matched from CD	• 424 obvs (212 from each group) • 127 obvs unmatched

P<0.05*,p<0.01**,p<0.001***

Multivariate regression analysis for kitchen equipment costs – two-part model

Kitchen equipment costs

The findings presented below are the estimates for the two part-model. As mentioned in Section 2.5.3, there are two datasets created for each compound regression model. The kitchen equipment costs are reported as a one-off cost.

The first component is a logistic regression which models the occurrence of a zero value in the kitchen equipment costs based on 1,559 observations (of which 577 had non-zero costs). This estimates the difference in probability of spending on kitchen equipment between the FHS types.

The second component is a log-linear regression which models the non-zero costs (based on 577 observations). This estimates the difference in costs between FHS types that reported spending on additional kitchen equipment due to their FHS.

The key findings (statistically significant results are bolded) from the analysis from both components are:

Lower odds of having non-zero kitchen equipment costs for those with FA than those with CD: On average, with a fully adjusted model, those with FA have 6.9 fold [95% CI 5.2 – 9.2, $p < 0.001$] higher odds of having a one-off spending on kitchen equipment than those with CD.

Lower odds of having non-zero kitchen equipment costs for those in the FIO category than those with CD: On average, with a fully adjusted model, those in the FIO category have 5.0 fold [95% CI 3.6 – 6.9, $p < 0.001$] lower odds of having a one-off spending on kitchen equipment than those with CD .

For those that reported spending on kitchen equipment costs, there is higher spending for those with FA compared to those with CD: Conditional on reported spending, those with FA spend 18.6% more than those with CD [$p = 0.1$]

For those that reported spending on kitchen equipment costs, there is higher spending for those in the FIO category compared to those with CD: Conditional on reported spending, those in the FIO category spend 20.0% more than those with CD [$p = 0.2$]

Given that the log-linear regression models (second component based only on reported spending) did not identify cost differences between FHS types there will be no estimates combining the two components.

Table 31: One-off kitchen equipment costs of FHS households broken down by FHS group using generalised linear stepwise regression models of Binomial family

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
(Intercept)	-0.638**	-0.707**	-0.712**	-0.671**	-0.924***	-0.381	-0.630	-0.452
Standard error	(0.196)	(0.231)	(0.235)	(0.236)	(0.263)	(0.434)	(0.532)	(0.539)
FHStypeCD	1.609***	1.632***	1.628***	1.682***	1.726***	1.711***	1.696***	1.690***

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Standard error	(0.168)	(0.170)	(0.170)	(0.171)	(0.172)	(0.172)	(0.172)	(0.172)
FHStypeFA	-0.329	-0.281	-0.288	-0.208	-0.221	-0.349	-0.361	-0.359
Standard error	(0.190)	(0.193)	(0.193)	(0.194)	(0.195)	(0.202)	(0.202)	(0.202)
hh_sizeMedium HH	-0.404*	-0.413*	-0.407*	-0.369*	-0.383*	-0.478*	-0.466*	-0.477*
Standard error	(0.178)	(0.178)	(0.179)	(0.181)	(0.181)	(0.187)	(0.187)	(0.188)
hh_sizeSingle HH	1.972***	2.101***	2.094***	2.115***	2.181***	2.158***	-2.175***	-2.151***
Standard error	(0.255)	(0.267)	(0.268)	(0.269)	(0.271)	(0.274)	(0.276)	(0.275)
hh_sizeSmall HH	0.761***	0.816***	0.813***	0.792***	0.807***	0.791***	-0.801***	-0.800***
Standard error	(0.163)	(0.166)	(0.166)	(0.167)	(0.167)	(0.169)	(0.170)	(0.170)
hh_incomeLow	-	0.145	0.142	0.118	0.227	0.254	0.253	0.244
Standard error	-	(0.197)	(0.197)	(0.198)	(0.206)	(0.208)	(0.207)	(0.209)
hh_incomeMedium	-	0.253	0.251	0.249	0.286	0.300	0.310	0.313
Standard error	-	(0.170)	(0.171)	(0.171)	(0.169)	(0.170)	(0.170)	(0.170)
hh_incomeVery High	-	-0.095	-0.091	-0.071	-0.101	-0.098	-0.099	-0.094
Standard error	-	(0.181)	(0.182)	(0.182)	(0.182)	(0.182)	(0.182)	(0.182)
regionNorthern Ireland	-	-	0.130	0.134	0.156	0.121	0.106	0.112
Standard error	-	-	(0.341)	(0.348)	(0.349)	(0.349)	(0.349)	(0.347)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
regionScotland	-	-	-0.069	-0.089	-0.086	-0.096	-0.108	-0.122
Standard error	-	-	(0.215)	(0.217)	(0.216)	(0.218)	(0.218)	(0.218)
regionWales	-	-	0.170	0.172	0.141	0.125	0.137	0.104
Standard error	-	-	(0.296)	(0.300)	(0.302)	(0.304)	(0.309)	(0.309)
genderMale	-	-	-	0.508***	0.500***	0.580***	-0.585***	-0.587***
Standard error	-	-	-	(0.150)	(0.151)	(0.153)	(0.153)	(0.154)
genderother	-	-	-	0.041	-0.034	-0.054	-0.036	-0.044
Standard error	-	-	-	(0.893)	(0.956)	(0.967)	(0.962)	(0.957)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-	-	-	-	0.313*	0.309*	0.320*	0.321*
Standard error	-	-	-	-	(0.151)	(0.151)	(0.152)	(0.153)
educationNo qualifications	-	-	-	-	-0.414	-0.438	-0.438	-0.426
Standard error	-	-	-	-	(0.435)	(0.434)	(0.434)	(0.433)
age_groupAdult	-	-	-	-	-	-0.548	-0.543	-0.533
Standard error	-	-	-	-	-	(0.363)	(0.362)	(0.361)
age_groupChild	-	-	-	-	-	0.013	0.010	0.034
Standard error	-	-	-	-	-	(0.395)	(0.394)	(0.395)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ethnicityOther	-	-	-	-	-	-	13.235***	13.237***
Standard error	-	-	-	-	-	-	(0.854)	(0.840)
ethnicityWhite	-	-	-	-	-	-	0.265	0.217
Standard error	-	-	-	-	-	-	(0.343)	(0.342)
GeographyUrban	-	-	-	-	-	-	-	-0.220
Standard error	-	-	-	-	-	-	-	(0.124)
N	1559	1559	1559	1559	1559	1559	1559	1559

P<0.05*,p<0.01**,p<0.001***

Table 32: One-off kitchen equipment costs of FHS households broken down by FHS group using linear stepwise regression models with log-transformed costs larger than £0

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
(Intercept)	3.786***	3.793***	3.808***	3.808***	3.787***	3.588***	3.471***	3.486***
Standard error	(0.151)	(0.163)	(0.164)	(0.166)	(0.188)	(0.213)	(0.308)	(0.315)
FHStypeMDCD	-0.178	-0.157	-0.169	-0.181	-0.182	-0.179	-0.184	-0.182
Standard error	(0.135)	(0.135)	(0.138)	(0.142)	(0.143)	(0.144)	(0.144)	(0.145)
FHStypeMDFA	-0.016	-0.014	-0.028	-0.065	-0.066	-0.058	-0.058	-0.055
Standard error	(0.166)	(0.165)	(0.165)	(0.169)	(0.170)	(0.174)	(0.174)	(0.175)
hh_sizeMedium HH	-0.167	-0.180	-0.184	-0.204	-0.207	-0.216	-0.215	-0.216

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Standard error	(0.111)	(0.110)	(0.110)	(0.112)	(0.113)	(0.115)	(0.115)	(0.115)
hh_sizeSingle HH	-0.230	-0.300	-0.304	-0.309	-0.319	-0.326	-0.325	-0.325
Standard error	(0.180)	(0.189)	(0.189)	(0.190)	(0.189)	(0.191)	(0.190)	(0.191)
hh_sizeSmall HH	-0.090	-0.136	-0.138	-0.154	-0.161	-0.166	-0.167	-0.167
Standard error	(0.105)	(0.104)	(0.105)	(0.105)	(0.106)	(0.106)	(0.106)	(0.106)
hh_incomeLow	-	0.046	0.053	0.059	0.064	0.063	0.060	0.059
Standard error	-	(0.136)	(0.140)	(0.142)	(0.145)	(0.146)	(0.147)	(0.147)
hh_incomeMedium	-	0.092	0.094	0.084	0.086	0.083	0.082	0.083
Standard error	-	(0.126)	(0.128)	(0.131)	(0.133)	(0.133)	(0.134)	(0.134)
hh_incomeVery High	-	-0.141	-0.136	-0.152	-0.154	-0.160	-0.158	-0.157
Standard error	-	(0.108)	(0.108)	(0.109)	(0.110)	(0.111)	(0.112)	(0.112)
regionNorthern Ireland	-	-	-0.004	-0.027	-0.020	-0.024	-0.027	-0.028
Standard error	-	-	(0.190)	(0.196)	(0.195)	(0.195)	(0.195)	(0.196)
regionScotland	-	-	-0.096	-0.103	-0.105	-0.100	-0.099	-0.099
Standard error	-	-	(0.159)	(0.158)	(0.157)	(0.157)	(0.158)	(0.158)
regionWales	-	-	0.075	0.063	0.067	0.067	0.064	0.060

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Standard error	-	-	(0.166)	(0.163)	(0.163)	(0.161)	(0.162)	(0.164)
genderMale	-	-	-	0.194	0.194	0.199	0.198	0.198
Standard error	-	-	-	(0.120)	(0.120)	(0.123)	(0.123)	(0.123)
genderother	-	-	-	0.068	0.074	0.075	0.092	0.092
Standard error	-	-	-	(0.325)	(0.329)	(0.331)	(0.318)	(0.317)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-	-	-	-	0.028	0.030	0.031	0.029
Standard error	-	-	-	-	(0.092)	(0.092)	(0.092)	(0.092)
educationNo qualifications	-	-	-	-	0.186	0.201	0.200	0.197
Standard error	-	-	-	-	(0.239)	(0.238)	(0.239)	(0.240)
age_groupAdult	-	-	-	-	-	0.202	0.206	0.206
Standard error	-	-	-	-	-	(0.121)	(0.122)	(0.122)
age_groupChild	-	-	-	-	-	0.236	0.239	0.241
Standard error	-	-	-	-	-	(0.144)	(0.145)	(0.146)
ethnicityWhite	-	-	-	-	-	-	0.120	0.115

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Standard error	-	-	-	-	-	-	(0.237)	(0.239)
GeographyUrban	-	-	-	-	-	-	-	-0.017
Standard error	-	-	-	-	-	-	-	(0.079)
N	577	577	577	577	577	577	577	577

P<0.05*,p<0.01**,p<0.001***

Table 1: Multivariate logistic regression analysis of kitchen equipment costs within FHS types

Dependent variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
(Intercept)	3.786***	3.793***	3.808***	3.808***	3.787***	3.588***	3.471***	3.486***
Standard error	(0.151)	(0.163)	(0.164)	(0.166)	(0.188)	(0.213)	(0.308)	(0.315)
FHStypeCD	-0.178	-0.157	-0.169	-0.181	-0.182	-0.179	-0.184	-0.182
Standard error	(0.135)	(0.135)	(0.138)	(0.142)	(0.143)	(0.144)	(0.144)	(0.145)
FHStypeFA	-0.016	-0.014	-0.028	-0.065	-0.066	-0.058	-0.058	-0.055
Standard error	(0.166)	(0.165)	(0.165)	(0.169)	(0.170)	(0.174)	(0.174)	(0.175)
hh_sizeMedium HH	-0.167	-0.180	-0.184	-0.204	-0.207	-0.216	-0.215	-0.216
Standard error	(0.111)	(0.110)	(0.110)	(0.112)	(0.113)	(0.115)	(0.115)	(0.115)
hh_sizeSingle HH	-0.230	-0.300	-0.304	-0.309	-0.319	-0.326	-0.325	-0.325
Standard error	(0.180)	(0.189)	(0.189)	(0.190)	(0.189)	(0.191)	(0.190)	(0.191)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
hh_sizeSmall HH	-0.090	-0.136	-0.138	-0.154	-0.161	-0.166	-0.167	-0.167
Standard error	(0.105)	(0.104)	(0.105)	(0.105)	(0.106)	(0.106)	(0.106)	(0.106)
hh_incomeLow	-	0.046	0.053	0.059	0.064	0.063	0.060	0.059
Standard error	-	(0.136)	(0.140)	(0.142)	(0.145)	(0.146)	(0.147)	(0.147)
hh_incomeMedium	-	0.092	0.094	0.084	0.086	0.083	0.082	0.083
Standard error	-	(0.126)	(0.128)	(0.131)	(0.133)	(0.133)	(0.134)	(0.134)
hh_incomeVery High	-	-0.141	-0.136	-0.152	-0.154	-0.160	-0.158	-0.157
Standard error	-	(0.108)	(0.108)	(0.109)	(0.110)	(0.111)	(0.112)	(0.112)
regionNorthern Ireland	-	-	-0.004	-0.027	-0.020	-0.024	-0.027	-0.028
Standard error	-	-	(0.190)	(0.196)	(0.195)	(0.195)	(0.195)	(0.196)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
regionScotland	-	-	-0.096	-0.103	-0.105	-0.100	-0.099	-0.099
Standard error	-	-	(0.159)	(0.158)	(0.157)	(0.157)	(0.158)	(0.158)
regionWales	-	-	0.075	0.063	0.067	0.067	0.064	0.060
Standard error	-	-	(0.166)	(0.163)	(0.163)	(0.161)	(0.162)	(0.164)
genderMale	-	-	-	0.194	0.194	0.199	0.198	0.198
Standard error	-	-	-	(0.120)	(0.120)	(0.123)	(0.123)	(0.123)
Genderother	-	-	-	0.068	0.074	0.075	0.092	0.092
Standard error	-	-	-	(0.325)	(0.329)	(0.331)	(0.318)	(0.317)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-	-	-	-	0.028	0.030	0.031	0.029
Standard error	-	-	-	-	(0.092)	(0.092)	(0.092)	(0.092)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
educationNo qualifications	-	-	-	-	0.186	0.201	0.200	0.197
Standard error	-	-	-	-	(0.239)	(0.238)	(0.239)	(0.240)
age_groupAdult	-	-	-	-	-	0.202	0.206	0.206
Standard error	-	-	-	-	-	(0.121)	(0.122)	(0.122)
age_groupChild	-	-	-	-	-	0.236	0.239	0.241
Standard error	-	-	-	-	-	(0.144)	(0.145)	(0.146)
ethnicityWhite	-	-	-	-	-	-	0.120	0.115
Standard error	-	-	-	-	-	-	(0.237)	(0.239)
GeographyUrban	-	-	-	-	-	-	-	-0.017
Standard error	-	-	-	-	-	-	-	(0.079)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
R^2	0.012	0.021	0.023	0.029	0.030	0.032	0.032	0.032
N	577	577	577	577	577	577	577	577

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Multivariate regression analysis for medical costs – complete cases analysis and two-part model

Medical costs

The findings presented below are the estimates for the two part-model. The two-part model process used here is similar to the one for kitchen equipment costs, except this does not include observations where there are missing values (explained in the paragraph below).

As the findings below show, conditional on spending on medical costs (eg nutritional supplement costs, prescription medication cists, specialist medical costs), there is a statistically significant difference in costs between the FHS types in both model components. Thus, the results from both parts of the model were combined through bootstrapping (see Section 1.2 in Appendix 6 for further details) to provide a combined expected average cost and their confidence intervals for each FHS type. Due to the complexity of the analysis, only observations without missing values were kept for this analysis. This meant the log-linear regression model has 635 observations while the logistic regression model has 1,051 observations.

Firstly, the results from the two-part model are presented below with the statistically significant results in bold. The key findings from the analysis are:

Higher odds of having non-zero medical costs for those with FA than those with CD: On average, with a fully adjusted model. those with FA have 1.9 [95% CI 1.5 – 2.4, $p < 0.001$] higher odds of spending on medical costs than those with CD.

Higher odds of having non-zero medical costs for those in the FIO category than those with CD: On average, with a fully adjusted model, those in the FIO category have 1.3 [$p = 0.1$] higher odds of spending on medical costs than those with CD.

For those that reported spending on medical costs, those with FA have higher costs than those with CD: Conditional on having reported spending, those with FA have 3.5% [$p = 0.7$] higher costs than those with CD.

For those that reported spending on medical costs, those in the FIO category have higher costs than those with CD: Conditional on having reported spending, those in the FIO category have 56.2% [95% CI 29.3% to 88.7%, $p < 0.001$] higher costs than those with CD.

The bootstrapped results which provide combines estimates from both model stages are:

Higher medical costs for those with FA and those with CD: On average, with a fully adjusted model, those with FA spend £5.21 [95% CI 2.02 – 8.92] more than those with CD.

Higher medical costs for those in the FIO category than those with CD: On average, with a fully adjusted model, those in the FIO category spend £8.57 [95% CI 4.42 – 13.86] more than those with CD.

Table 33: Monthly medical costs of FHS households broken down by FHS group using a generalised linear stepwise regression model of Binomial family (Model 2) and a linear regression model with log-transformed costs larger than £0 (Model 1)

Dependent variable	Model 1	Model 2
FHStypeCD	-0.393***	-0.363**
Standard error	(0.106)	(0.185)
FHStypeFA	-0.303***	0.633***
Standard error	(0.111)	(0.212)
hh_sizeMedium HH	-0.264**	0.227
Standard error	(0.121)	(0.230)
hh_sizeSingle HH	-0.541***	-0.517*
Standard error	(0.155)	(0.269)
hh_sizeSmall HH	-0.298***	-0.439**
Standard error	(0.113)	(0.203)
hh_incomeLow	0.093	-0.209

Dependent variable	Model 1	Model 2
Standard error	(0.126)	(0.218)
hh_incomeMedium	-0.036	-0.077
Standard error	(0.103)	(0.184)
hh_incomeVery High	0.080	-0.116
Standard error	(0.103)	(0.190)
regionNorthern Ireland	-0.059	-0.883**
Standard error	(0.247)	(0.372)
regionScotland	-0.071	-0.330
Standard error	(0.144)	(0.245)
regionWales	-0.525**	-0.548*
Standard error	(0.206)	(0.333)
genderMale	-0.036	-0.656***
Standard error	(0.101)	(0.163)

Dependent variable	Model 1	Model 2
genderother	-0.469	1.474
Standard error	(0.364)	(1.085)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-0.043	0.083
Standard error	(0.096)	(0.166)
educationNo qualifications	0.345	-0.283
Standard error	(0.312)	(0.451)
age_groupAdult	1.160***	0.574
Standard error	(0.253)	(0.419)
age_groupChild	0.639**	0.135
Standard error	(0.268)	(0.447)
ethnicityOther	-	-14.798
Standard error	-	(535.411)
ethnicityWhite	-0.463**	-0.407

Dependent variable	Model 1	Model 2
Standard error	(0.186)	(0.407)
GeographyRural	-1.680*	-13.085
Standard error	(0.948)	(535.411)
GeographyUrban	-1.750*	-13.122
Standard error	(0.946)	(535.411)
Constant	4.317***	13.910
Standard error	(1.001)	(535.412)
N	636	1,052
R^2	0.132	-

P<0.05*,p<0.01**,p<0.001***

Multivariate regression analysis for indirect costs

The sections below present the findings for the three indirect cost outcomes. As mentioned in Section 2.5.4, the negative binomial model was used for both paid days and unpaid days lost, while a log-linear regression was used for extra time costs. For all three costs, there is no comparison with the non-FHS household group as these outcomes are not relevant to them. The statistically significant results are in bold.

Multivariate zero-inflated negative binomial regression analysis for paid work days lost

The key findings from the fully adjusted model when all demographic and household variants are considered are:

- **Higher costs of paid days lost per year for FA compared to CD:** On average, those with FA lose 1.38 days more [p = 0.4] due to FHS compared to those with CD. The cost of paid days lost for FA is then £158.70 more than those with CD.[23]

- **Higher costs of paid days lost per year for those in the FIO category compared to CD:** On average, those in the FIO category lose 2.54 days more [95% CI 1.11 – 5.80, p = 0.03] due to FHS. compared to those with CD. The cost of paid days lost for those in the FIO category is then £292.10 more than those with CD.[24]

[23] This cost is calculated using annual median income of £29,900 with the equation:

$$\frac{1.38 * 29{,}900}{52 * 5}$$

[24] Calculated using equation:

$$\frac{2.54 * 29{,}900}{52 * 5}$$

Table 34: Paid days lost per year of FHS households broken down by FHS group using zero-inflated negative binomial stepwise regression models

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
(Intercept)	1.676***	1.588**	1.734**	1.758**	2.427***	1.772**	2.633**	2.160*
-	(0.498)	(0.541)	(0.557)	(0.534)	(0.503)	(0.598)	(0.820)	(0.940)
FHStypeCD	-0.819	-0.733	-0.793	-0.883*	-1.055**	-1.066**	-1.064**	-0.933*
-	(0.451)	(0.434)	(0.445)	(0.391)	(0.349)	(0.356)	(0.371)	(0.420)
FHStypeFA	-0.261	-0.299	-0.473	-0.535	-0.593	-0.646	-0.746	-0.614
-	(0.453)	(0.406)	(0.393)	(0.384)	(0.369)	(0.404)	(0.429)	(0.494)
hh_sizeMedium HH	-0.543	-0.446	-0.472	-0.544	-0.610	-0.648	-0.590	-0.530
-	(0.413)	(0.403)	(0.400)	(0.416)	(0.366)	(0.391)	(0.389)	(0.420)
hh_sizeSingle HH	-0.378	-0.717	-0.692	-0.667	-0.520	-0.485	-0.360	-0.401
-	(0.493)	(0.477)	(0.492)	(0.473)	(0.477)	(0.483)	(0.497)	(0.612)
hh_sizeSmall HH	-0.485	-0.656	-0.756*	-0.904**	-0.884**	-0.892**	-0.840**	-0.810*
-	(0.415)	(0.345)	(0.358)	(0.339)	(0.334)	(0.336)	(0.317)	(0.410)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
hh_incomeLow	-	0.622	0.439	0.407	0.366	0.286	0.229	0.179
-	-	(0.616)	(0.644)	(0.640)	(0.573)	(0.584)	(0.554)	(0.637)
hh_incomeMedium	-	0.278	0.217	0.127	0.066	0.015	0.050	0.009
-	-	(0.555)	(0.590)	(0.576)	(0.472)	(0.481)	(0.492)	(0.460)
hh_incomeVery High	-	-0.426	-0.430	-0.609	-0.366	-0.428	-0.392	-0.468
-	-	(0.413)	(0.420)	(0.437)	(0.402)	(0.410)	(0.398)	(0.392)
regionNorthern Ireland	-	-	-0.081	-0.091	-0.126	-0.078	-0.032	-0.054
-	-	-	(0.356)	(0.350)	(0.366)	(0.368)	(0.370)	(0.404)
regionScotland	-	-	-0.182	-0.011	0.015	0.069	0.137	0.101
-	-	-	(0.358)	(0.336)	(0.335)	(0.341)	(0.366)	(0.509)
regionWales	-	-	0.986	1.220	1.036	1.114	1.254*	1.264*
-	-	-	(0.662)	(0.648)	(0.565)	(0.577)	(0.579)	(0.618)
genderMale	-	-	-	0.670	0.516	0.510	0.496	0.563

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
-	-	-	-	(0.483)	(0.411)	(0.428)	(0.434)	(0.393)
Genderother	-	-	-	-3.090**	-3.414***	-3.397***	-3.438***	-3.364***
-	-	-	-	(0.994)	(0.968)	(0.960)	(0.947)	(0.944)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-	-	-	-	-0.774	-0.820	-0.867	-0.928*
-	-	-	-	-	(0.418)	(0.422)	(0.445)	(0.387)
educationNo qualifications	-	-	-	-	-2.798***	-2.868***	-2.829***	-3.004***
-	-	-	-	-	(0.844)	(0.857)	(0.843)	(0.832)
age_groupAdult	-	-	-	-	-	0.728	0.645	0.661
-	-	-	-	-	-	(0.419)	(0.426)	(0.452)
age_groupChild	-	-	-	-	-	1.078*	1.013*	0.943*
-	-	-	-	-	-	(0.437)	(0.431)	(0.463)
ethnicityOther	-	-	-	-	-	-	-36.213	-50.509
-	-	-	-	-	-	-	(24.006)	(29.668)

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ethnicityWhite	-	-	-	-	-	-	-0.834	-0.703
-	-	-	-	-	-	-	(0.546)	(0.630)
GeographyUrban	-	-	-	-	-	-	-	0.452
-	-	-	-	-	-	-	-	(0.331)
R^2	0.000	0.001	0.001	0.001	0.001	0.000	0.000	-0.002
N	1559	1559	1559	1559	1559	1559	1559	1559

P<0.05*,p<0.01**,p<0.001***

Multivariate zero-inflated negative binomial regression analysis for unpaid days lost

The key findings from the fully adjusted model when all demographic and household variants are considered are:

- **Higher costs of unpaid days lost per year for FA compared to CD:** On average, those with FA lose 2.13 days more [95% CI 1.17 – 3.88, p = 0.01] compared to those with CD. The cost of unpaid days lost for FA is £145.59 more than those with CD.[25]

[25] This cost is calculated using national hourly living wage of £8.72 and assuming they spend an average of 8 hours a day on these activities, with the equation:

$$8.72 * 8 * 2.13$$

- **Higher costs of unpaid days lost per year for those in the FIO category compared to CD:** On average, those in the FIO category lose 3.72 days more [95% CI 2.02 – 6.86, p < 0.001] compared to those with CD. The cost of unpaid days lost for in the FIO category is £259.51 more than those with CD. [26]

[26] Calculated using equation:

$$8.72 * 8 * 3.72$$

Table 35: Unpaid days lost per year of FHS households broken down by FHS group using zero-inflated negative binomial stepwise regression models

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
(Intercept)	2.251***	2.166***	2.050***	2.064***	1.953***	2.076**	1.278	1.514
-	(0.427)	(0.439)	(0.420)	(0.412)	(0.480)	(0.699)	(0.793)	(0.828)
FHStypeCD	-1.301***	-1.277***	-1.309***	-1.338***	-1.307***	-1.310***	-1.303***	-1.315***
-	(0.343)	(0.306)	(0.308)	(0.305)	(0.300)	(0.303)	(0.308)	(0.311)
FHStypeFA	-0.311	-0.391	-0.388	-0.444	-0.491	-0.532	-0.511	-0.560
-	(0.398)	(0.360)	(0.362)	(0.359)	(0.357)	(0.379)	(0.376)	(0.377)
hh_sizeMedium HH	-0.833*	-0.589	-0.532	-0.539	-0.536	-0.601*	-0.562	-0.587*
-	(0.325)	(0.313)	(0.293)	(0.292)	(0.291)	(0.298)	(0.297)	(0.298)
hh_sizeSingle HH	-0.504	-0.946*	-0.817*	-0.846*	-0.865*	-0.890	-0.882	-0.874*
-	(0.467)	(0.436)	(0.413)	(0.411)	(0.429)	(0.445)	(0.445)	(0.437)
hh_sizeSmall HH	-0.373	-0.525	-0.458	-0.451	-0.471	-0.494	-0.461	-0.486
-	(0.352)	(0.309)	(0.288)	(0.286)	(0.295)	(0.304)	(0.301)	(0.305)
hh_incomeLow	-	0.898*	0.857*	0.892*	0.996*	1.016*	1.017*	0.989*

-	-	(0.389)	(0.384)	(0.387)	(0.412)	(0.418)	(0.410)	(0.406)
hh_incomeMedium	-	0.127	0.132	0.146	0.163	0.188	0.170	0.182
-	-	(0.391)	(0.384)	(0.384)	(0.387)	(0.406)	(0.394)	(0.386)
hh_incomeVery High	-	-0.642	-0.635	-0.647	-0.638	-0.649	-0.643	-0.667
-	-	(0.370)	(0.372)	(0.371)	(0.363)	(0.356)	(0.347)	(0.353)
regionNorthern Ireland	-	-	0.101	0.045	0.221	0.250	0.224	0.260
-	-	-	(0.665)	(0.639)	(0.793)	(0.812)	(0.810)	(0.821)
regionScotland	-	-	0.281	0.297	0.240	0.252	0.226	0.233
-	-	-	(0.463)	(0.461)	(0.452)	(0.455)	(0.455)	(0.457)
regionWales	-	-	0.698	0.707	0.771	0.790	0.808	0.811
-	-	-	(0.506)	(0.506)	(0.548)	(0.556)	(0.547)	(0.544)
genderMale	-	-	-	0.085	0.113	0.067	0.095	0.125
-	-	-	-	(0.286)	(0.285)	(0.294)	(0.287)	(0.291)
Genderother	-	-	-	-1.719**	-1.655*	-1.656*	-1.632*	-1.677**

-	-	-	-	(0.624)	(0.665)	(0.667)	(0.667)	(0.632)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-	-	-	-	0.136	0.146	0.169	0.184
-	-	-	-	-	(0.356)	(0.366)	(0.360)	(0.344)
educationNo qualifications	-	-	-	-	-2.869	-2.862	-2.867	-2.792
-	-	-	-	-	(1.393)	(1.398)	(1.394)	(1.385)
age_groupAdult	-	-	-	-	-	-0.119	-0.069	-0.014
-	-	-	-	-	-	(0.644)	(0.630)	(0.605)
age_groupChild	-	-	-	-	-	0.103	0.153	0.191
-	-	-	-	-	-	(0.638)	(0.625)	(0.596)
ethnicityOther	-	-	-	-	-	-	-29.213	-31.313
-	-	-	-	-	-	-	(24.607)	(24.772)
ethnicityWhite	-	-	-	-	-	-	0.718	0.603
-	-	-	-	-	-	-	(0.434)	(0.440)
GeographyUrban	-	-	-	-	-	-	-	-0.243

-	-	-	-	-	-	-	-	(0.249)
R^2	0.000	0.002	0.003	0.004	0.004	0.004	0.004	0.006
N	1559	1559	1559	1559	1559	1559	1559	1559

P<0.05*,p<0.01**,p<0.001***

Multivariate and univariate regression analysis for extra time costs

The key findings from the fully adjusted model when all demographic and household variants are considered are:

- **More extra time spent per week for those with FA compared to those with CD:** On average, those with FA spend 3.2% [95% CI: -19.1% to 0.2%; p = 0.05][27] more time on these activities per week compared to those with CD.
- **More extra time spent per week for those in the FIO category compared to those with CD:** On average, those with FA spend 3.2% [95% CI: -19.1% to 0.2%; p = 0.05] more time on these activities per week compared to those with CD

Meanwhile, the key findings from the univariate regression (model which does not consider any demographic and household variants) are the same as the multivariate regression:

- **There is no statistically significant difference in extra time costs per week between those with CD and those in the FIO category**: The difference in costs between those in the FIO category and CD is not statistically significant [p = 0.13].

[27] The chosen criteria for statistical significance of a model coefficient was a 95% Confidence Interval that excluded zero

- **There is no statistically significant difference in extra time costs per week between those with FA and those in the FIO category**: The difference in costs between those in the FIO category and FA is not statistically significant [p = 0.79].

For sociodemographic variables, estimates for the FHS group show:

Single, small, and medium households have lower extra time costs per week compared to large households: On average, single, small, and medium households have 29.6% less [95% CI – 39.6% to – 17.8%, p < 0.001], 19.6% less [95% CI – 28.3% to – 9.9%, p < 0.001], and 14.2% less [95% CI – 24.1% to – 3.1%, p = 0.01] costs compared to large households, respectively.

Low-income households have higher extra time costs per week compared to high-income households: On average, low-income households have 17.3% [95% CI 3.2% - 33.4%, p = 0.02] higher costs compared to high-income households.

Table 36: Extra time spend per week on FHS-related activities by FHS households broken down by FHS group using linear stepwise regression models with log-transformed costs

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
(Intercept)	3.909***	3.839***	3.837***	3.836***	3.770***	3.833***	3.915***	3.940***
-	(0.070)	(0.080)	(0.081)	(0.081)	(0.086)	(0.164)	(0.191)	(0.191)
FHStypeCD	-0.084	-0.089	-0.090	-0.092	-0.085	-0.090	-0.103	-0.105

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
-	(0.056)	(0.055)	(0.055)	(0.055)	(0.056)	(0.056)	(0.055)	(0.055)
FHStypeFA	-0.032	-0.022	-0.025	-0.028	-0.030	-0.056	-0.073	-0.073
-	(0.060)	(0.060)	(0.060)	(0.061)	(0.061)	(0.064)	(0.063)	(0.063)
hh_sizeMedium HH	-0.158*	-0.150*	-0.148*	-0.150*	-0.154*	-0.181**	-0.173**	-0.174**
-	(0.062)	(0.062)	(0.062)	(0.063)	(0.063)	(0.064)	(0.064)	(0.064)
hh_sizeSingle HH	-0.347***	-0.442***	-0.440***	-0.443***	-0.458***	-0.449***	-0.447***	-0.444***
-	(0.080)	(0.085)	(0.085)	(0.085)	(0.086)	(0.086)	(0.086)	(0.087)
hh_sizeSmall HH	-0.217***	-0.231***	-0.230***	-0.231***	-0.237***	-0.235***	-0.230***	-0.230***
-	(0.059)	(0.059)	(0.059)	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)
hh_incomeLow	-	0.252***	0.248***	0.255***	0.270***	0.275***	0.275***	0.274***

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
-	-	(0.070)	(0.070)	(0.068)	(0.069)	(0.070)	(0.071)	(0.071)
hh_incomeMedium	-	0.087	0.084	0.085	0.090	0.091	0.096	0.096
-	-	(0.058)	(0.058)	(0.058)	(0.057)	(0.057)	(0.055)	(0.055)
hh_incomeVery High	-	0.032	0.030	0.030	0.021	0.018	0.020	0.021
-	-	(0.061)	(0.061)	(0.061)	(0.062)	(0.063)	(0.063)	(0.064)
regionNorthern Ireland	-	-	-0.037	-0.039	-0.032	-0.038	-0.037	-0.036
-	-	-	(0.118)	(0.118)	(0.118)	(0.119)	(0.119)	(0.119)
regionScotland	-	-	0.039	0.044	0.047	0.046	0.045	0.044
-	-	-	(0.068)	(0.069)	(0.069)	(0.068)	(0.068)	(0.068)
regionWales	-	-	0.071	0.069	0.068	0.063	0.100	0.094

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
-	-	-	(0.099)	(0.099)	(0.100)	(0.100)	(0.101)	(0.102)
genderMale	-	-	-	0.016	0.014	-0.008	-0.012	-0.012
-	-	-	-	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)
genderother	-	-	-	-0.203	-0.211	-0.207	-0.218	-0.219
-	-	-	-	(0.380)	(0.377)	(0.378)	(0.376)	(0.376)
educationHigher level education (NQF Levels 4, 5, 6, 7, 8)	-	-	-		0.086	0.084	0.086	0.086
-	-	-	-	-	(0.048)	(0.048)	(0.048)	(0.048)
educationNo qualifications	-	-	-	-	0.104	0.100	0.104	0.106
-	-	-	-	-	(0.142)	(0.143)	(0.143)	(0.143)
age_groupAdult	-	-	-	-	-	-0.060	-0.061	-0.059

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
-	-	-	-	-	-	(0.139)	(0.139)	(0.139)
age_groupChild	-	-	-	-	-	0.092	0.088	0.092
-	-	-	-	-	-	(0.145)	(0.144)	(0.145)
ethnicityOther	-	-	-	-	-	-	-2.351*	-2.360*
-	-	-	-	-	-	-	(1.061)	(1.052)
ethnicityWhite	-	-	-	-	-	-	-0.078	-0.084
-	-	-	-	-	-	-	(0.100)	(0.100)
GeographyUrban	-	-	-	-	-	-	-	-0.030
-	-	-	-	-	-	-	-	(0.041)
N	1557	1557	1557	1557	1557	1557	1557	1557

P<0.05*,p<0.01**,p<0.001***

Appendix 8: Summary Statistics

These summary statistics are presented for all 1,559 respondents to the survey, meaning households where the main person living with FHS is below 18 years old and are from Scotland have been included for these summary statistics.

Table 1: Full summary statistics of food consumption costs for FHS cohorts and non-FHS cohort

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Charac-teristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
Mean costs (sd)	103.53 (62.77)	92.25 (75.57)	94.09 (63.14)	76.99 (42.92)	98.53 (61.40)	92.62 (54.05)	100.41 (51.55)	74.75 (38.39)	59.26 (58.06)	57.13 (62.48)	62.13 (63.56)	49.15 (51.08)

Geography

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
Rural	43 / 117 (37%)	121 / 332 (36%)	47 / 126 (37%)	370 / 1,530 (24%)	70 / 233 (30%)	248 / 648 (38%)	115 / 339 (34%)	See Column 4	70 / 233 (30%)	249 / 651 (38%)	115 / 339 (34%)	See Column 4
Urban	74 / 117 (63%)	211 / 332 (64%)	79 / 126 (63%)	1,160 / 1,530 (76%)	163 / 233 (70%)	400 / 648 (62%)	224 / 339 (66%)	See Column 4	163 / 233 (70%)	402 / 651 (62%)	224 / 339 (66%)	See Column 4
(Missing)	1	0	0	0	1	0	0	See Column 4	1	0	0	See Column 4

Ethnicity

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
BAME	7 / 115 (6.1%)	7 / 330 (2.1%)	6 / 125 (4.8%)	65 / 1,525 (4.3%)	15 / 230 (6.5%)	11 / 645 (1.7%)	22 / 335 (6.6%)	See Column 4	15 / 230 (6.5%)	11 / 648 (1.7%)	22 / 335 (6.6%)	See Column 4
Other	0 / 115 (0%)	1 / 330 (0.3%)	0 / 125 (0%)	3 / 1,525 (0.2%)	2 / 230 (0.9%)	1 / 645 (0.2%)	0 / 335 (0%)	See Column 4	2 / 230 (0.9%)	1 / 648 (0.2%)	0 / 335 (0%)	See Column 4
White	108 / 115 (94%)	322 / 330 (98%)	119 / 125 (95%)	1,457 / 1,525 (96%)	213 / 230 (93%)	633 / 645 (98%)	313 / 335 (93%)	See Column 4	213 / 230 (93%)	636 / 648 (98%)	313 / 335 (93%)	See Column 4

Region

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
England	112 / 118 (95%)	308 / 332 (93%)	116 / 126 (92%)	676 / 1,530 (44%)	219 / 234 (94%)	595 / 648 (92%)	310 / 339 (91%)	See Column 4	219 / 234 (94%)	598 / 651 (92%)	310 / 339 (91%)	See Column 4
Northern Ireland	5 / 118 (4.2%)	12 / 332 (3.6%)	4 / 126 (3.2%)	357 / 1,530 (23%)	11 / 234 (4.7%)	22 / 648 (3.4%)	8 / 339 (2.4%)	See Column 4	11 / 234 (4.7%)	22 / 651 (3.4%)	8 / 339 (2.4%)	See Column 4
Wales	1 / 118 (0.8%)	12 / 332 (3.6%)	6 / 126 (4.8%)	497 / 1,530 (32%)	4 / 234 (1.7%)	31 / 648 (4.8%)	21 / 339 (6.2%)	See Column 4	4 / 234 (1.7%)	31 / 651 (4.8%)	21 / 339 (6.2%)	See Column 4

Education

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
Entry level education (NQF Levels 1, 2, 3)	19 / 114 (17%)	90 / 322 (28%)	25 / 124 (20%)	636 / 1,516 (42%)	44 / 227 (19%)	174 / 622 (28%)	55 / 328 (17%)	See Column 4	44 / 227 (19%)	174 / 625 (28%)	55 / 329 (17%)	See Column 4
Higher level education (NQF Levels 4, 5, 6, 7, 8)	95 / 114 (83%)	219 / 322 (68%)	98 / 124 (79%)	813 / 1,516 (54%)	180 / 227 (79%)	424 / 622 (68%)	272 / 328 (83%)	See Column 4	180 / 227 (79%)	427 / 625 (68%)	273 / 329 (83%)	See Column 4
No qualifications	0 / 114 (0%)	13 / 322 (4.0%)	1 / 124 (0.8%)	67 / 1,516 (4.4%)	3 / 227 (1.3%)	24 / 622 (3.9%)	1 / 328 (0.3%)	See Column 4	3 / 227 (1.3%)	24 / 625 (3.8%)	1 / 329 (0.3%)	See Column 4
(Missing)	4	10	2	14	7	26	11	See Column 4	7	26	10	See Column 4

Age

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
18-19	0 / 115 (0%)	7 / 332 (2.1%)	2 / 125 (1.6%)	3 / 1,530 (0.2%)	1 / 231 (0.4%)	11 / 647 (1.7%)	14 / 335 (4.2%)	See Column 4	1 / 231 (0.4%)	11 / 650 (1.7%)	13 / 334 (3.9%)	See Column 4
20-29	12 / 115 (10%)	47 / 332 (14%)	34 / 125 (27%)	104 / 1,530 (6.8%)	25 / 231 (11%)	93 / 647 (14%)	95 / 335 (28%)	See Column 4	25 / 231 (11%)	93 / 650 (14%)	95 / 334 (28%)	See Column 4
30-39	20 / 115 (17%)	44 / 332 (13%)	20 / 125 (16%)	220 / 1,530 (14%)	38 / 231 (16%)	80 / 647 (12%)	59 / 335 (18%)	See Column 4	38 / 231 (16%)	81 / 650 (12%)	59 / 334 (18%)	See Column 4
40-49	28 / 115 (24%)	48 / 332 (14%)	27 / 125 (22%)	293 / 1,530 (19%)	61 / 231 (26%)	86 / 647 (13%)	58 / 335 (17%)	See Column 4	61 / 231 (26%)	88 / 650 (14%)	58 / 334 (17%)	See Column 4
50-59	29 / 115 (25%)	70 / 332 (21%)	18 / 125 (14%)	330 / 1,530 (22%)	51 / 231 (22%)	126 / 647 (19%)	51 / 335 (15%)	See Column 4	51 / 231 (22%)	126 / 650 (19%)	51 / 334 (15%)	See Column 4

60-69	15 / 115 (13%)	64 / 332 (19%)	14 / 125 (11%)	379 / 1,530 (25%)	33 / 231 (14%)	134 / 647 (21%)	36 / 335 (11%)	See Column 4	33 / 231 (14%)	134 / 650 (21%)	36 / 334 (11%)	See Column 4
70-79	8 / 115 (7.0%)	47 / 332 (14%)	10 / 125 (8.0%)	184 / 1,530 (12%)	15 / 231 (6.5%)	106 / 647 (16%)	19 / 335 (5.7%)	See Column 4	15 / 231 (6.5%)	106 / 650 (16%)	19 / 334 (5.7%)	See Column 4
80+	3 / 115 (2.6%)	5 / 332 (1.5%)	0 / 125 (0%)	17 / 1,530 (1.1%)	7 / 231 (3.0%)	11 / 647 (1.7%)	3 / 335 (0.9%)	See Column 4	7 / 231 (3.0%)	11 / 650 (1.7%)	3 / 334 (0.9%)	See Column 4
(Missing)	3	0	1	0	3	1	4	See Column 4	3	1	5	See Column 4

Gender

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]

Female	102 / 115 (89%)	261 / 329 (79%)	109 / 125 (87%)	799 / 1,527 (52%)	198 / 230 (86%)	508 / 643 (79%)	263 / 332 (79%)	See Column 4	198 / 230 (86%)	511 / 646 (79%)	264 / 333 (79%)	See Column 4
Male	12 / 115 (10%)	64 / 329 (19%)	16 / 125 (13%)	728 / 1,527 (48%)	30 / 230 (13%)	129 / 643 (20%)	68 / 332 (20%)	See Column 4	30 / 230 (13%)	129 / 646 (20%)	68 / 333 (20%)	See Column 4
other	1 / 115 (0.9%)	4 / 329 (1.2%)	0 / 125 (0%)	0 / 1,527 (0%)	2 / 230 (0.9%)	6 / 643 (0.9%)	1 / 332 (0.3%)	See Column 4	2 / 230 (0.9%)	6 / 646 (0.9%)	1 / 333 (0.3%)	See Column 4
(Missing)	3	3	1	3	4	5	7	See Column 4	4	5	6	See Column 4

Household size

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]

Large	18 / 118 (15%)	40 / 332 (12%)	15 / 126 (12%)	139 / 1,530 (9.1%)	30 / 234 (13%)	88 / 648 (14%)	68 / 339 (20%)	See Column 4	30 / 234 (13%)	89 / 651 (14%)	68 / 339 (20%)	See Column 4
Medium	27 / 118 (23%)	59 / 332 (18%)	17 / 126 (13%)	306 / 1,530 (20%)	53 / 234 (23%)	115 / 648 (18%)	69 / 339 (20%)	See Column 4	53 / 234 (23%)	116 / 651 (18%)	69 / 339 (20%)	See Column 4
Single	16 / 118 (14%)	52 / 332 (16%)	25 / 126 (20%)	352 / 1,530 (23%)	31 / 234 (13%)	97 / 648 (15%)	39 / 339 (12%)	See Column 4	31 / 234 (13%)	97 / 651 (15%)	39 / 339 (12%)	See Column 4
Small	57 / 118 (48%)	181 / 332 (55%)	69 / 126 (55%)	733 / 1,530 (48%)	120 / 234 (51%)	348 / 648 (54%)	163 / 339 (48%)	See Column 4	120 / 234 (51%)	349 / 651 (54%)	163 / 339 (48%)	See Column 4

Household income

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]

High	21 / 93 (23%)	56 / 257 (22%)	26 / 98 (27%)	238 / 1,400 (17%)	39 / 166 (23%)	102 / 460 (22%)	63 / 229 (28%)	See Column 4	39 / 166 (23%)	102 / 462 (22%)	63 / 229 (28%)	See Column 4
Low	18 / 93 (19%)	75 / 257 (29%)	23 / 98 (23%)	503 / 1,400 (36%)	26 / 166 (16%)	119 / 460 (26%)	42 / 229 (18%)	See Column 4	26 / 166 (16%)	119 / 462 (26%)	42 / 229 (18%)	See Column 4
Medium	35 / 93 (38%)	79 / 257 (31%)	30 / 98 (31%)	527 / 1,400 (38%)	65 / 166 (39%)	145 / 460 (32%)	63 / 229 (28%)	See Column 4	65 / 166 (39%)	145 / 462 (31%)	63 / 229 (28%)	See Column 4
Very High	19 / 93 (20%)	47 / 257 (18%)	19 / 98 (19%)	132 / 1,400 (9.4%)	36 / 166 (22%)	94 / 460 (20%)	61 / 229 (27%)	See Column 4	36 / 166 (22%)	96 / 462 (21%)	61 / 229 (27%)	See Column 4
(Missing)	25	75	28	130	68	188	110	See Column 4	68	189	110	See Column 4

Shop

-	Weekly Food Diary Costs				Weekly Groceries Costs				Monthly Eating out / Takeaway Spend			
Characteristic	**FIO**, N = 118[1]	**CD**, N = 332[1]	**FA**, N = 126[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 648[1]	**FA**, N = 339[1]	**Non-FHS**, N = 1,530[1]	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
Large supermarket chains	95 / 118 (81%)	305 / 331 (92%)	115 / 125 (92%)	1,375 / 1,530 (90%)	195 / 234 (83%)	599 / 647 (93%)	308 / 338 (91%)	See Column 4	NA	NA	NA	NA
Online	18 / 118 (15%)	18 / 331 (5.4%)	10 / 125 (8.0%)	109 / 1,530 (7.1%)	31 / 234 (13%)	34 / 647 (5.3%)	25 / 338 (7.4%)	See Column 4	NA	NA	NA	NA
Other outlets (eg specialist or independent stores)	5 / 118 (4.2%)	8 / 331 (2.4%)	0 / 125 (0%)	46 / 1,530 (3.0%)	8 / 234 (3.4%)	14 / 647 (2.2%)	5 / 338 (1.5%)	See Column 4	NA	NA	NA	NA
(Missing)	0	1	1	0	0	1	1	See Column 4	NA	NA	NA	NA

Frequency of eating out/takeaways

Characteristic	**FIO**, N = 234[1]	**CD**, N = 651[1]	**FA**, N = 339[1]	**Non-FHS** , N = 1,530[1]
3-4 times a week	1 / 228 (0.4%)	9 / 638 (1.4%)	9 / 322 (2.8%)	55 / 1,530 (3.6%)
5-6 times a week	2 / 228 (0.9%)	2 / 638 (0.3%)	3 / 322 (0.9%)	8 / 1,530 (0.5%)
At least once a day	3 / 228 (1.3%)	5 / 638 (0.8%)	3 / 322 (0.9%)	15 / 1,530 (1.0%)
Less than once a month	47 / 228 (21%)	192 / 638 (30%)	82 / 322 (25%)	312 / 1,530 (20%)
Never	NA	NA	NA	NA
Once a fortnight	NA	NA	NA	NA
Once a month	NA	NA	NA	NA

Once or twice a week	NA	NA	NA	NA
(Missing)	NA	NA	NA	NA

Table 2: Summary statistics of kitchen equipment costs for FHS cohorts

Kitchen Equipment Costs

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]	**p-value**[2]
Mean (SD)	14.26 (46.09)	27.02 (52.19)	14.41 (69.25)	<0.001
Median (IQR)	0 (0,0)	11 (0,35)	0 (0,0)	<0.001

Geography

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Rural	88 / 275 (32%)	295 / 762 (39%)	169 / 521 (32%)
Urban	187 / 275 (68%)	467 / 762 (61%)	352 / 521 (68%)
(Missing)	1	0	0

Ethnicity

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
BAME	15 / 272 (5.5%)	14 / 757 (1.8%)	33 / 516 (6.4%)
Other	2 / 272 (0.7%)	1 / 757 (0.1%)	0 / 516 (0%)
White	255 / 272 (94%)	742 / 757 (98%)	483 / 516 (94%)
(Missing)	4	5	5

Region

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
England	228 / 275 (83%)	649 / 762 (85%)	429 / 520 (82%)
Northern Ireland	13 / 275 (4.7%)	22 / 762 (2.9%)	15 / 520 (2.9%)
Scotland	30 / 275 (11%)	57 / 762 (7.5%)	47 / 520 (9.0%)
Wales	4 / 275 (1.5%)	34 / 762 (4.5%)	29 / 520 (5.6%)
(Missing)	1	0	1

Education

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
Entry level education (NQF Levels 1, 2, 3)	54 / 268 (20%)	206 / 732 (28%)	78 / 507 (15%)
Higher level education (NQF Levels 4, 5, 6, 7, 8)	210 / 268 (78%)	499 / 732 (68%)	427 / 507 (84%)
No qualifications	4 / 268 (1.5%)	27 / 732 (3.7%)	2 / 507 (0.4%)
(Missing)	8	30	14

Age Group

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
Adolescent	2 / 273 (0.7%)	10 / 760 (1.3%)	29 / 515 (5.6%)

Adult	261 / 273 (96%)	702 / 760 (92%)	369 / 515 (72%)
Child	10 / 273 (3.7%)	48 / 760 (6.3%)	117 / 515 (23%)
(Missing)	3	2	6

Gender

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Female	234 / 272 (86%)	593 / 756 (78%)	353 / 512 (69%)
Male	35 / 272 (13%)	157 / 756 (21%)	155 / 512 (30%)
other	3 / 272 (1.1%)	6 / 756 (0.8%)	4 / 512 (0.8%)
(Missing)	4	6	9

Household size

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Single	35 / 276 (13%)	105 / 762 (14%)	48 / 521 (9.2%)
Small	132 / 276 (48%)	386 / 762 (51%)	230 / 521 (44%)
Medium	73 / 276 (26%)	159 / 762 (21%)	151 / 521 (29%)
Large	36 / 276 (13%)	112 / 762 (15%)	92 / 521 (18%)

Household income

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
Low	33 / 197 (17%)	126 / 535 (24%)	58 / 367 (16%)
Medium	77 / 197 (39%)	169 / 535 (32%)	92 / 367 (25%)
High	45 / 197 (23%)	124 / 535 (23%)	98 / 367 (27%)
Very High	42 / 197 (21%)	116 / 535 (22%)	119 / 367 (32%)
(Missing)	79	227	154

Table 3: Summary statistics of medical costs for FHS cohorts

Medical Costs

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]	p-value[2]
Mean (SD)	16.99 (27.54)	10.74 (54.81)	21.05 (189.62)	<0.001
Median (IQR)	7 (0, 25)	2 (0, 11)	5 (0, 17)	<0.001

Geography

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]
0	1 / 269 (0.4%)	0 / 759 (0%)	0 / 502 (0%)
Rural	87 / 269 (32%)	293 / 759 (39%)	164 / 502 (33%)
Urban	181 / 269 (67%)	466 / 759 (61%)	338 / 502 (67%)

Ethnicity

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]

BAME	15 / 265 (5.7%)	14 / 754 (1.9%)	30 / 497 (6.0%)
Other	2 / 265 (0.8%)	1 / 754 (0.1%)	0 / 497 (0%)
White	248 / 265 (94%)	739 / 754 (98%)	467 / 497 (94%)
(Missing)	4	5	5

Region

Characteristic	**FIO**, N = 269[1]	**CD**, N = 759[1]	**FA**, N = 502[1]
England	223 / 269 (83%)	646 / 759 (85%)	412 / 501 (82%)
Northern Ireland	12 / 269 (4.5%)	22 / 759 (2.9%)	15 / 501 (3.0%)
Scotland	30 / 269 (11%)	57 / 759 (7.5%)	45 / 501 (9.0%)
Wales	4 / 269 (1.5%)	34 / 759 (4.5%)	29 / 501 (5.8%)
(Missing)	0	0	1

Education

Characteristic	**FIO**, N = 269[1]	**CD**, N = 759[1]	**FA**, N = 502[1]
Entry level education (NQF Levels 1, 2, 3)	54 / 261 (21%)	204 / 729 (28%)	75 / 488 (15%)
Higher level education (NQF Levels 4, 5, 6, 7, 8)	203 / 261 (78%)	498 / 729 (68%)	411 / 488 (84%)
No qualifications	4 / 261 (1.5%)	27 / 729 (3.7%)	2 / 488 (0.4%)
(Missing)	8	30	14

Age Group

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]
Adolescent	2 / 266 (0.8%)	10 / 757 (1.3%)	28 / 496 (5.6%)
Adult	255 / 266 (96%)	699 / 757 (92%)	353 / 496 (71%)
Child	9 / 266 (3.4%)	48 / 757 (6.3%)	115 / 496 (23%)
(Missing)	3	2	6

Gender

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]
0	0 / 265 (0%)	0 / 753 (0%)	1 / 494 (0.2%)
Female	228 / 265 (86%)	591 / 753 (78%)	339 / 494 (69%)
Male	34 / 265 (13%)	156 / 753 (21%)	151 / 494 (31%)
other	3 / 265 (1.1%)	6 / 753 (0.8%)	3 / 494 (0.6%)
(Missing)	4	6	8

Household size

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]
Large HH	33 / 269 (12%)	112 / 759 (15%)	88 / 502 (18%)
Medium HH	72 / 269 (27%)	158 / 759 (21%)	148 / 502 (29%)
Single HH	33 / 269 (12%)	105 / 759 (14%)	46 / 502 (9.2%)
Small HH	131 / 269 (49%)	384 / 759 (51%)	220 / 502 (44%)

Household income

Characteristic	FIO, N = 269[1]	CD, N = 759[1]	FA, N = 502[1]
High	44 / 191 (23%)	124 / 533 (23%)	95 / 355 (27%)
Low	32 / 191 (17%)	125 / 533 (23%)	56 / 355 (16%)
Medium	75 / 191 (39%)	168 / 533 (32%)	88 / 355 (25%)
Very High	40 / 191 (21%)	116 / 533 (22%)	116 / 355 (33%)
(Missing)	78	226	147

Table 4: Summary statistics of costs of paid work days for FHS cohorts

Costs of paid workdays lost

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]	p-value[2]
Mean (SD)	469.58 (2,751.97)	178.99 (1,309.80)	306.81 (2,008.61)	0.01
Median (IQR)	0 (0, 29)	0 (0, 0)	0 (0, 115)	0.01

Geography

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
Rural	88 / 275 (32%)	295 / 762 (39%)	169 / 521 (32%)
Urban	187 / 275 (68%)	467 / 762 (61%)	352 / 521 (68%)
(Missing)	1	0	0

Ethnicity

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
BAME	15 / 272 (5.5%)	14 / 757 (1.8%)	33 / 516 (6.4%)

Other	2 / 272 (0.7%)	1 / 757 (0.1%)	0 / 516 (0%)
White	255 / 272 (94%)	742 / 757 (98%)	483 / 516 (94%)
(Missing)	4	5	5

Region

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
England	228 / 275 (83%)	649 / 762 (85%)	429 / 520 (82%)
Northern Ireland	13 / 275 (4.7%)	22 / 762 (2.9%)	15 / 520 (2.9%)
Scotland	30 / 275 (11%)	57 / 762 (7.5%)	47 / 520 (9.0%)
Wales	4 / 275 (1.5%)	34 / 762 (4.5%)	29 / 520 (5.6%)
(Missing)	1	0	1

Education

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Entry level education (NQF Levels 1, 2, 3)	54 / 268 (20%)	206 / 732 (28%)	78 / 507 (15%)
Higher level education (NQF Levels 4, 5, 6, 7, 8)	210 / 268 (78%)	499 / 732 (68%)	427 / 507 (84%)
No qualifications	4 / 268 (1.5%)	27 / 732 (3.7%)	2 / 507 (0.4%)
(Missing)	8	30	14

Age Group

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]

Adolescent	2 / 273 (0.7%)	10 / 760 (1.3%)	29 / 515 (5.6%)
Adult	261 / 273 (96%)	702 / 760 (92%)	369 / 515 (72%)
Child	10 / 273 (3.7%)	48 / 760 (6.3%)	117 / 515 (23%)
(Missing)	3	2	6

Gender

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Female	234 / 272 (86%)	593 / 756 (78%)	353 / 512 (69%)
Male	35 / 272 (13%)	157 / 756 (21%)	155 / 512 (30%)
other	3 / 272 (1.1%)	6 / 756 (0.8%)	4 / 512 (0.8%)
(Missing)	4	6	9

Household size

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Single	35 / 276 (13%)	105 / 762 (14%)	48 / 521 (9.2%)
Small	132 / 276 (48%)	386 / 762 (51%)	230 / 521 (44%)
Medium	73 / 276 (26%)	159 / 762 (21%)	151 / 521 (29%)
Large	36 / 276 (13%)	112 / 762 (15%)	92 / 521 (18%)

Household income

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Low	33 / 197 (17%)	126 / 535 (24%)	58 / 367 (16%)
Medium	77 / 197 (39%)	169 / 535 (32%)	92 / 367 (25%)

High	45 / 197 (23%)	124 / 535 (23%)	98 / 367 (27%)
Very High	42 / 197 (21%)	116 / 535 (22%)	119 / 367 (32%)
(Missing)	79	227	154

[1] n / N (%); Mean (SD)

[2] Pearson's Chi-squared test; Fisher's exact test; Kruskal-Wallis rank sum tes

Table 5: Summary statistics of costs of unpaid days for FHS cohorts

Unpaid Days Lost Costs

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]	**p-value**[2]
Mean (SD)	447.63 (2,368.40)	123.04 (550.76)	306.35 (1,905.59)	0.025
Median (IQR)	0 (0, 0)	0 (0, 0)	0 (0, 0)	0.025

Geography

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Rural	88 / 275 (32%)	295 / 762 (39%)	169 / 521 (32%)
Urban	187 / 275 (68%)	467 / 762 (61%)	352 / 521 (68%)
(Missing)	1	0	0

Ethnicity

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
BAME	15 / 272 (5.5%)	14 / 757 (1.8%)	33 / 516 (6.4%)
Other	2 / 272 (0.7%)	1 / 757 (0.1%)	0 / 516 (0%)
White	255 / 272 (94%)	742 / 757 (98%)	483 / 516 (94%)

(Missing)	4	5	5

Region

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
England	228 / 275 (83%)	649 / 762 (85%)	429 / 520 (82%)
Northern Ireland	13 / 275 (4.7%)	22 / 762 (2.9%)	15 / 520 (2.9%)
Scotland	30 / 275 (11%)	57 / 762 (7.5%)	47 / 520 (9.0%)
Wales	4 / 275 (1.5%)	34 / 762 (4.5%)	29 / 520 (5.6%)
(Missing)	1	0	1

Education

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Entry level education (NQF Levels 1, 2, 3)	54 / 268 (20%)	206 / 732 (28%)	78 / 507 (15%)
Higher level education (NQF Levels 4, 5, 6, 7, 8)	210 / 268 (78%)	499 / 732 (68%)	427 / 507 (84%)
No qualifications	4 / 268 (1.5%)	27 / 732 (3.7%)	2 / 507 (0.4%)
(Missing)	8	30	14

Age group

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Adolescent	2 / 273 (0.7%)	10 / 760 (1.3%)	29 / 515 (5.6%)
Adult	261 / 273 (96%)	702 / 760 (92%)	369 / 515 (72%)

Child	10 / 273 (3.7%)	48 / 760 (6.3%)	117 / 515 (23%)
(Missing)	3	2	6

Gender

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Female	234 / 272 (86%)	593 / 756 (78%)	353 / 512 (69%)
Male	35 / 272 (13%)	157 / 756 (21%)	155 / 512 (30%)
other	3 / 272 (1.1%)	6 / 756 (0.8%)	4 / 512 (0.8%)
(Missing)	4	6	9

Household Size

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Single	35 / 276 (13%)	105 / 762 (14%)	48 / 521 (9.2%)
Small	132 / 276 (48%)	386 / 762 (51%)	230 / 521 (44%)
Medium	73 / 276 (26%)	159 / 762 (21%)	151 / 521 (29%)
Large	36 / 276 (13%)	112 / 762 (15%)	92 / 521 (18%)

Household Income

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
Low	33 / 197 (17%)	126 / 535 (24%)	58 / 367 (16%)
Medium	77 / 197 (39%)	169 / 535 (32%)	92 / 367 (25%)
High	45 / 197 (23%)	124 / 535 (23%)	98 / 367 (27%)
Very High	42 / 197 (21%)	116 / 535 (22%)	119 / 367 (32%)
(Missing)	79	227	154

Table 6: Summary statistics of extra time costs for FHS cohorts

Extra Time Costs

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]	p-value[2]
Mean (SD)	6.72 (7.92)	5.92 (7.89)	6.63 (9.16)	0.2
Median (IQR)	4.2 (2.8, 6.7)	4.0 (2.7, 6.2)	4.1 (2.7, 6.7)	0.2

Geography

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
Rural	88 / 275 (32%)	294 / 760 (39%)	169 / 521 (32%)
Urban	187 / 275 (68%)	466 / 760 (61%)	352 / 521 (68%)
(Missing)	1	0	0

Ethnicity

Characteristic	FIO, N = 276[1]	CD, N = 762[1]	FA, N = 521[1]
BAME	15 / 272 (5.5%)	14 / 755 (1.9%)	33 / 516 (6.4%)

Other	2 / 272 (0.7%)	0 / 755 (0%)	0 / 516 (0%)
White	255 / 272 (94%)	741 / 755 (98%)	483 / 516 (94%)
(Missing)	4	5	5

Region

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
England	228 / 275 (83%)	647 / 760 (85%)	429 / 520 (82%)
Northern Ireland	13 / 275 (4.7%)	22 / 760 (2.9%)	15 / 520 (2.9%)
Scotland	30 / 275 (11%)	57 / 760 (7.5%)	47 / 520 (9.0%)
Wales	4 / 275 (1.5%)	34 / 760 (4.5%)	29 / 520 (5.6%)
(Missing)	1	0	1

Education

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Entry level education (NQF Levels 1, 2, 3)	54 / 268 (20%)	206 / 730 (28%)	78 / 507 (15%)
Higher level education (NQF Levels 4, 5, 6, 7, 8)	210 / 268 (78%)	497 / 730 (68%)	427 / 507 (84%)
No qualifications	4 / 268 (1.5%)	27 / 730 (3.7%)	2 / 507 (0.4%)
(Missing)	8	30	14

Age group

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Adolescent	2 / 273 (0.7%)	10 / 758 (1.3%)	29 / 515 (5.6%)
Adult	261 / 273 (96%)	700 / 758 (92%)	369 / 515 (72%)
Child	10 / 273 (3.7%)	48 / 758 (6.3%)	117 / 515 (23%)
(Missing)	3	2	6

Gender

Characteristic	**FIO**, N = 276[1]	**CD**, N = 762[1]	**FA**, N = 521[1]
Female	234 / 272 (86%)	591 / 754 (78%)	353 / 512 (69%)
Male	35 / 272 (13%)	157 / 754 (21%)	155 / 512 (30%)
other	3 / 272 (1.1%)	6 / 754 (0.8%)	4 / 512 (0.8%)
(Missing)	4	6	9

Appendix 9: FHS Survey Descriptive Analysis

Demographics

The graphs below provide a demographic analysis of the FHS survey sample population, including FHS groups, gender, ethnicity, age, location and geography.

Figure 1: FHS groups from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

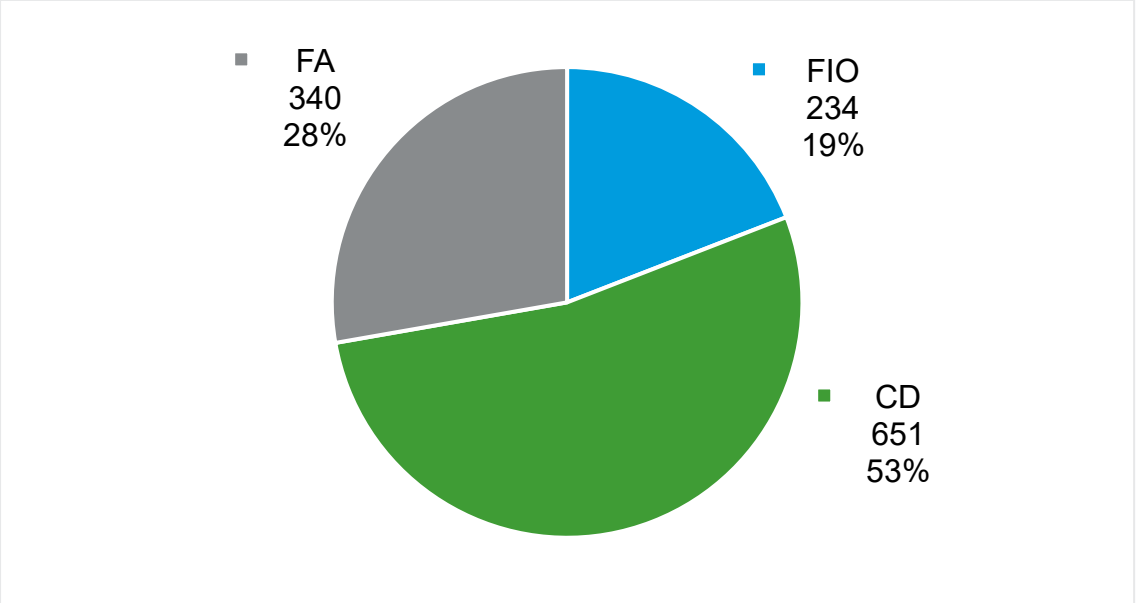


Figure 2: Gender of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

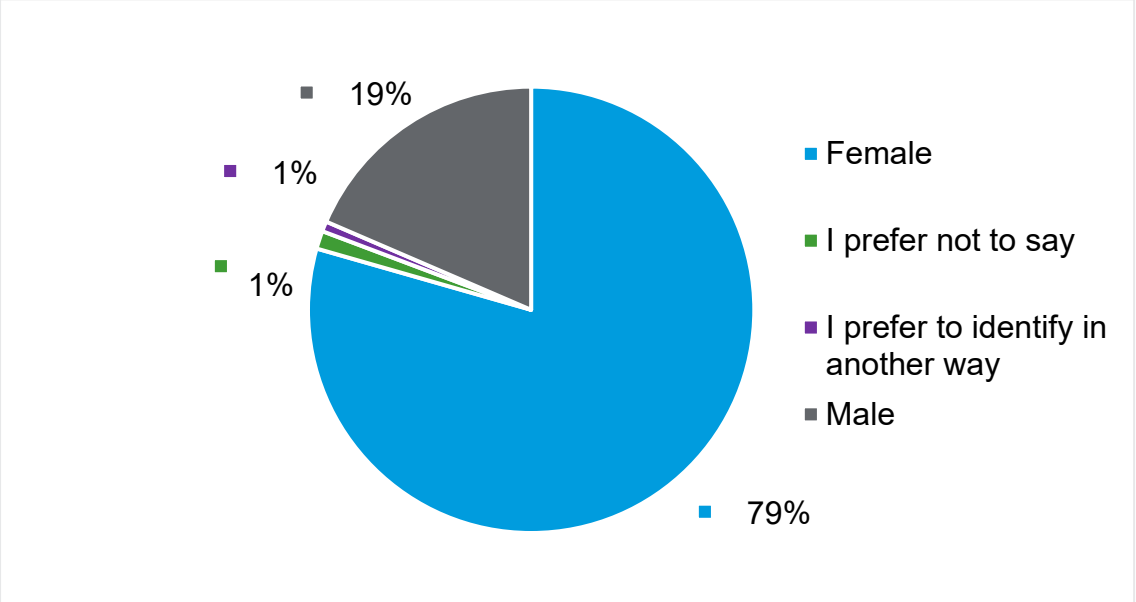


Table 1: Gender of people living with FHS by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

	Female	I prefer not to say	I prefer to identify in another way	Male
FIO	20%	25%	22%	13%
CD	53%	31%	67%	57%
FA	27%	44%	11%	30%

Figure 3: Ethnicity of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

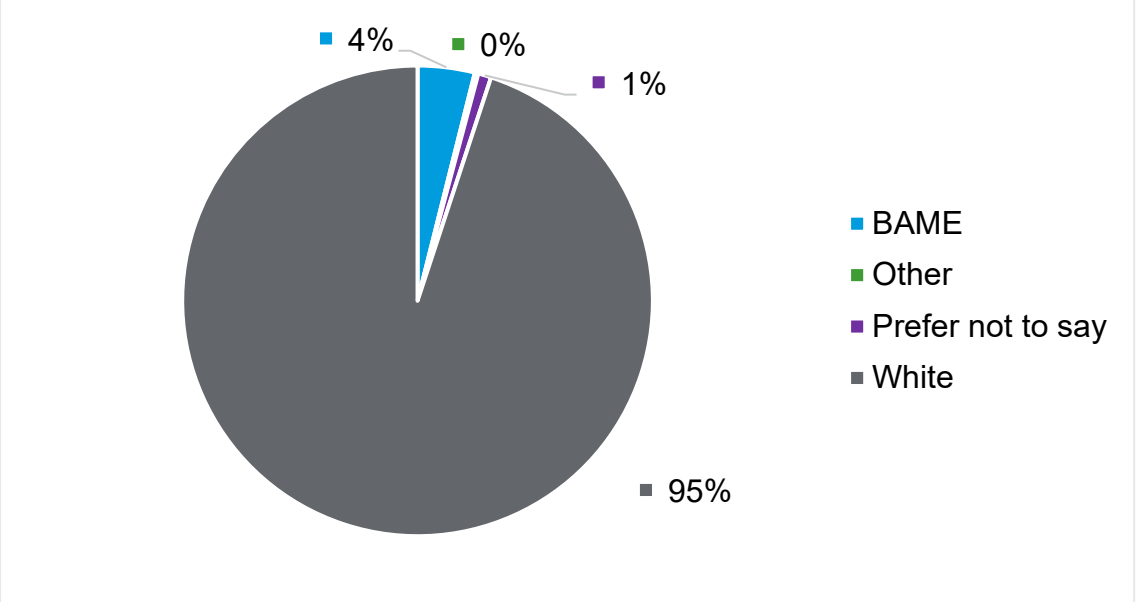


Table 2: Ethnicity of people living with FHS by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

	BAME	Other	Prefer not to say	White
FIO	31%	67%	36%	18%
CD	23%	33%	27%	55%
FA	46%	0%	36%	27%
Total	100%	100%	100%	100%

Figure 4: Location of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

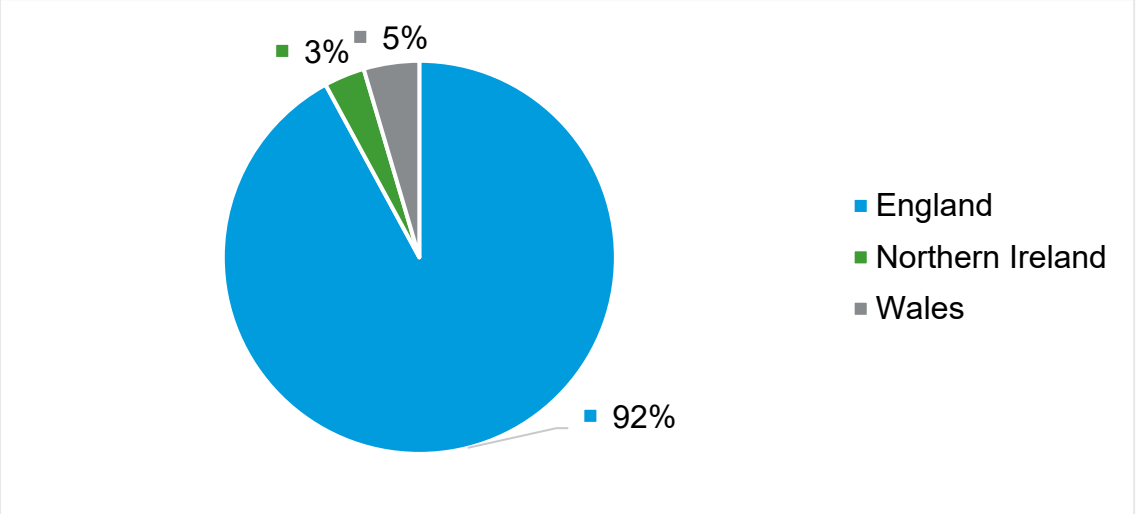
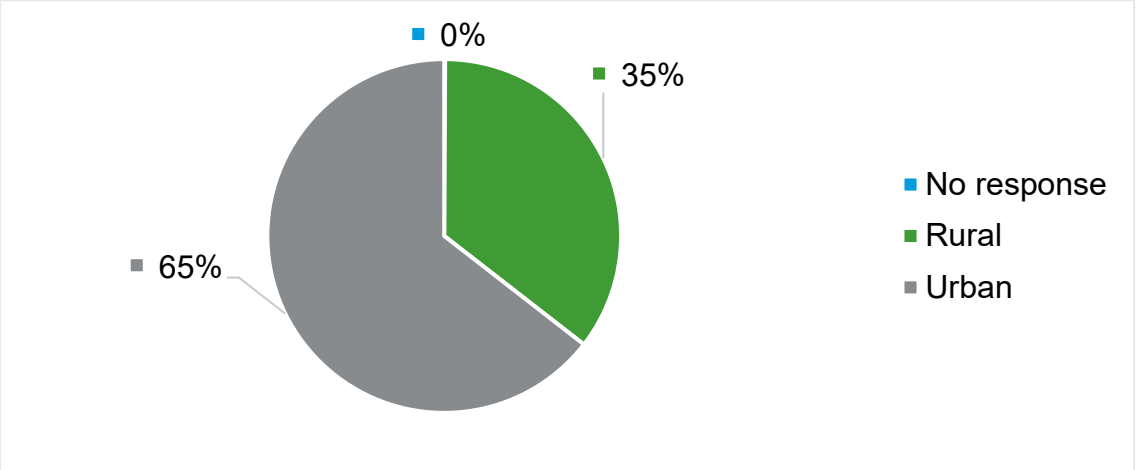


Table 3 – Split of regions of people living with FHS in England from FHS online survey (based on 92% of the sample used in the analysis, n=1,128) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

East Midlands	East of England	London	North East of England	North West of England	South East of England	South West of England	West Midlands	Yorkshire and the Humber
8%	10%	9%	6%	11%	26%	14%	8%	8%

Figure 5: Geography of people living with FHS in England from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Socioeconomic status

The graphs below provide a demographic analysis of the FHS survey sample population, including education and economic status of the respondents.

Figure 6: Education status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

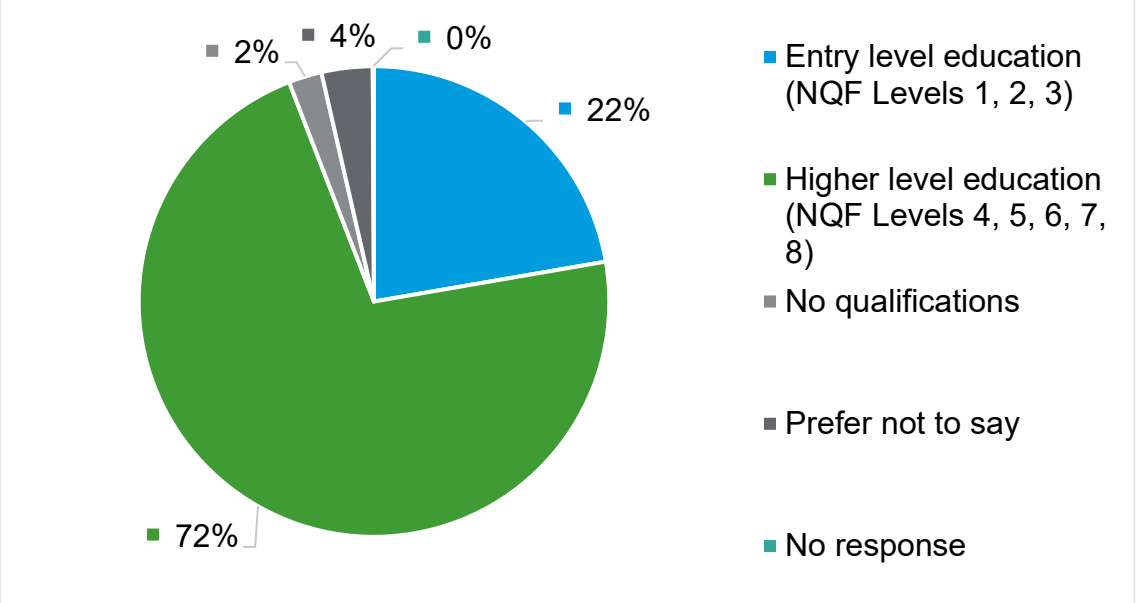
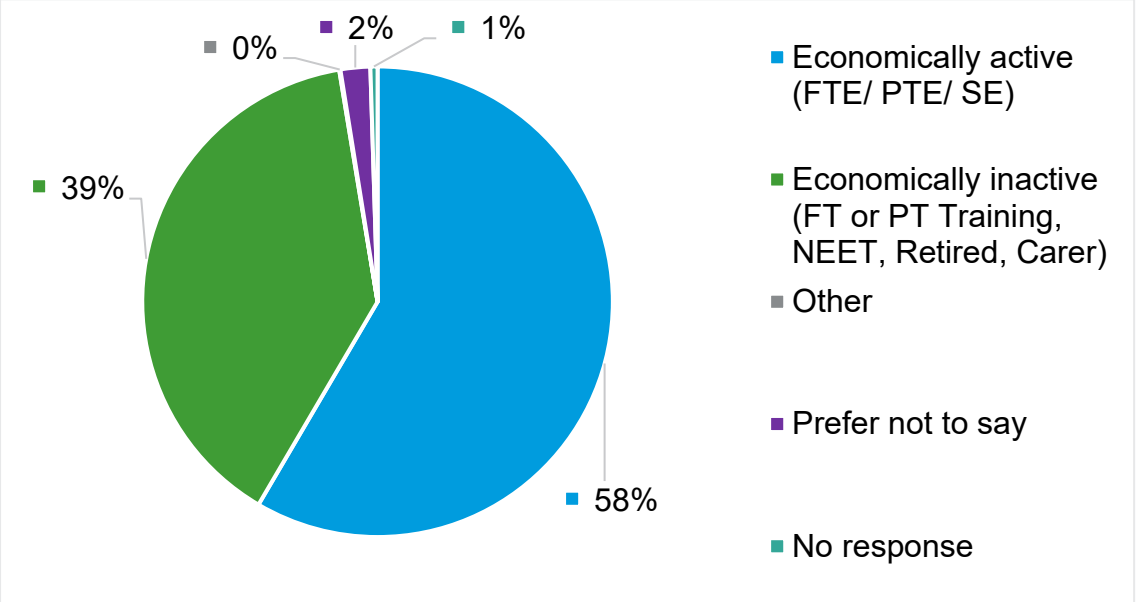


Figure 7: Economic status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Household composition

The graphs below provide a demographic analysis of the FHS survey sample population, including household size and household income. Both household size and income are composed variables from the data gathered in the survey. Each graph is followed by the table explaining the categories/bands used to create the variables.

Figure 8: Household size of FHS households from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

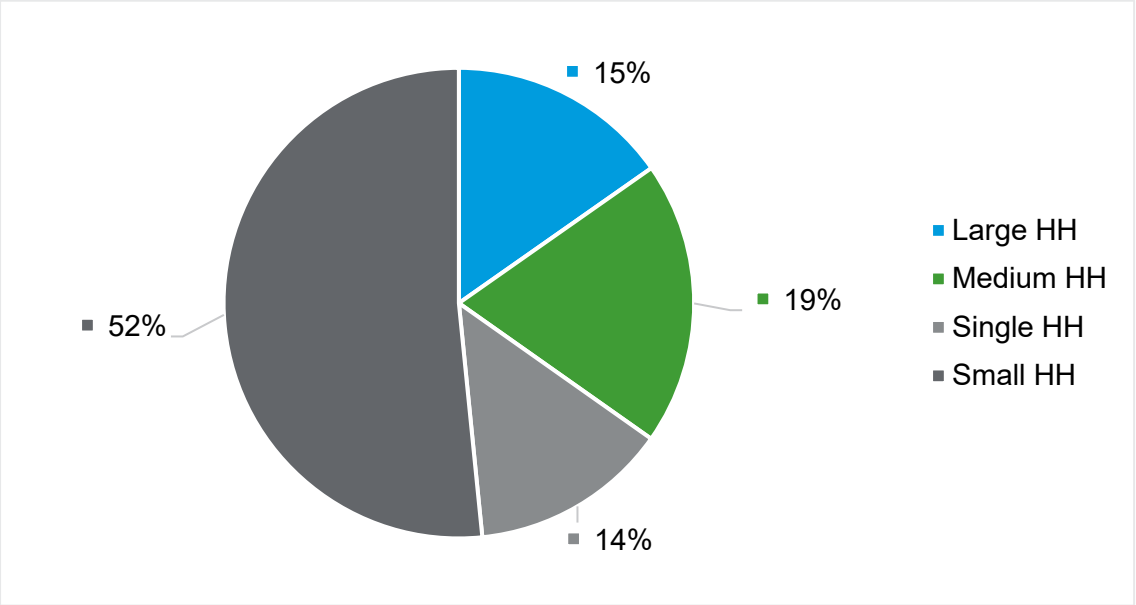


Table 4: Household size classification used to compose a household size variable from the FHS online survey conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

Singe HH	1 adult only
Small HH	1 adult+1-2 child OR 2 adult OR 2 adult+1 child
Medium HH	1 adult+3 child OR 2 adult+2-3 child OR 3 adult
Large HH	2 adult+4 child+ OR 3 adult+1 child+ OR 4 adult+

Figure 9: Household income band of FHS households from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

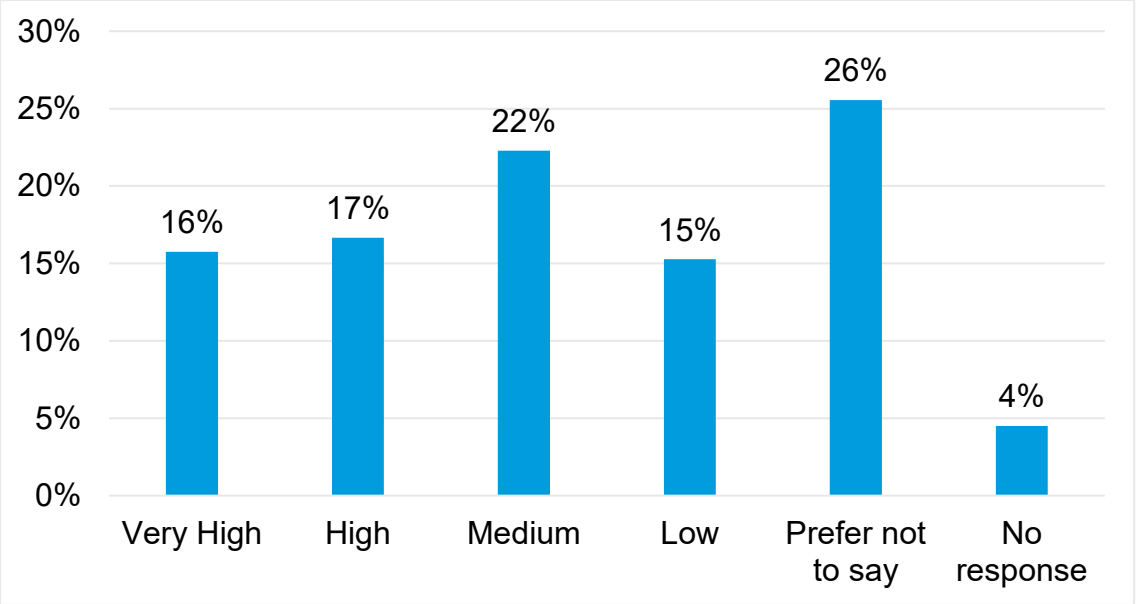


Table below describes the household incomes bands based on the ONS 2020 Average household income data: Less than £20,000, £20,000-£39,999, £40,000-£59,999, More than £60,000. Median household income in the UK = £29,900 (2019/20).

Table 5: Household income bands composed from the FHS online survey conducted in England, Northern Ireland, and Wales between November 2020 and January 2021 by using the ONS data

Very High	£65,001-£89,000 OR £89,001+
High	£42,001-£51,000 OR £51,001-£65,000
Medium	£22,001-£29,000 OR £29,001-£35,000 OR £35,001-£42,000
Low	£0-£11,000 OR £11,001-£17,000 OR £17,001-£22,000

Diagnosing food hypersensitivity

The following graphs indicate which tests people living with FHS used as part of diagnosis cross tabulated by FHS cohort, age group, education status, geography, economic status, and household income. This question allowed to choose multiple answers and the graphs indicate how frequently each test was chosen.

Figure 10: Tests used by the people living with CD and FA as part of the diagnosis from FHS online survey (based on 81% of the sample used in the analysis, n=991) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

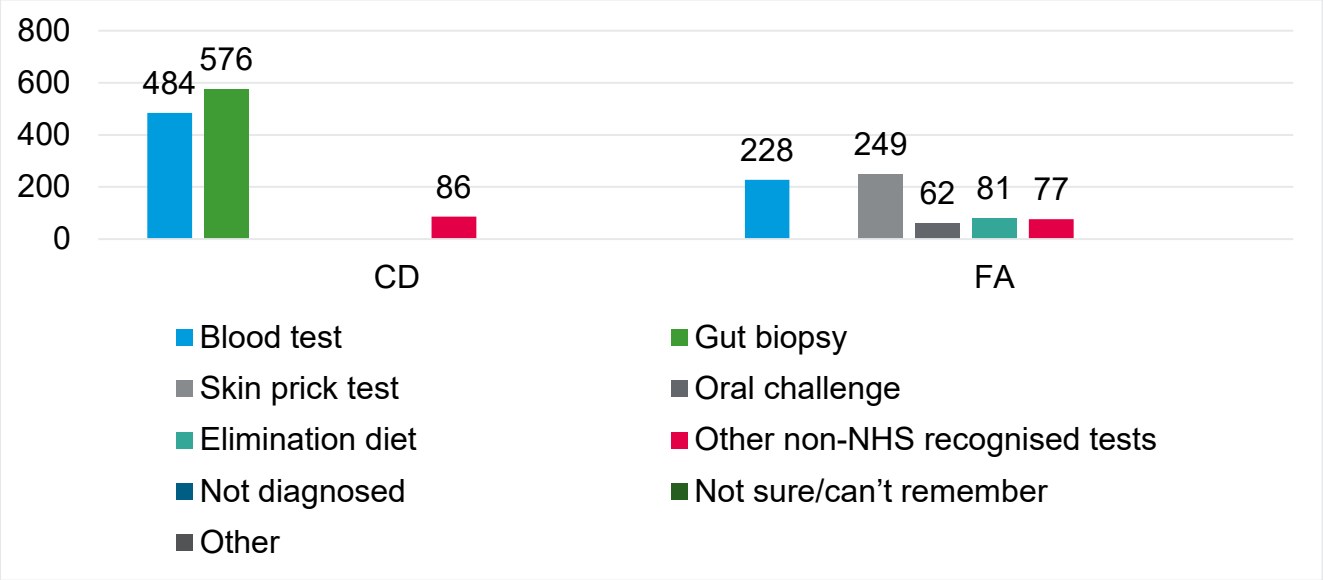


Table 6: Tests used by the people living with FIO as part of the diagnosis from FHS online survey (based on 19% of the sample used in the analysis, n=234) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

	Blood test	Gut biopsy	Skin prick test	Oral challenge	Elimination diet	Other non-NHS recognised tests	Not diagnosed	Not sure/can't remember	Other
FIO	56	26	23	12	100		65	6	16

***Other non-NHS recognised methods of diagnosis:** The non-NHS recognised methods of diagnosis differ between those with CD and MA (see Figure 11 for which methods are NHS recognised). Additionally, other non-NHS recognised methods listed by respondents include Dentist tested calcium deficiency, Colonoscopy, Capsule Endoscopy, Anaphylaxis reaction, Alternative therapist/

homeopathic tests, Electrodermal test, Lactose hydrogen breath test, Wave electrode test (Vega), Food diary, Medical history, Stool test, Asset test, Autonomic response testing, BAM scan test, Barium test, Glucose absorption test, Hair sample, Lactose enzyme medication, Patch tests.

Shopping preferences

The following graphs present person living with FHS's shopping preferences cross-tabulated by FHS cohort, geography, education status, economic status, and household income.

Figure 11: Shopping preferences of people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

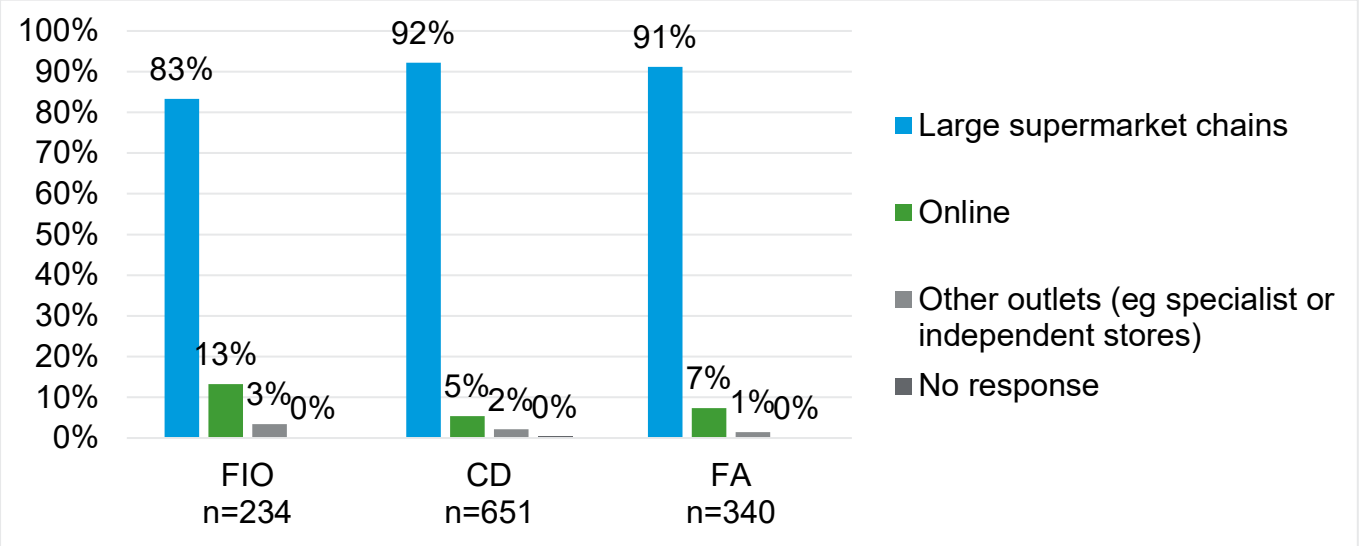


Figure 12: Shopping preferences of people living with FHS broken down by urban / rural location of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

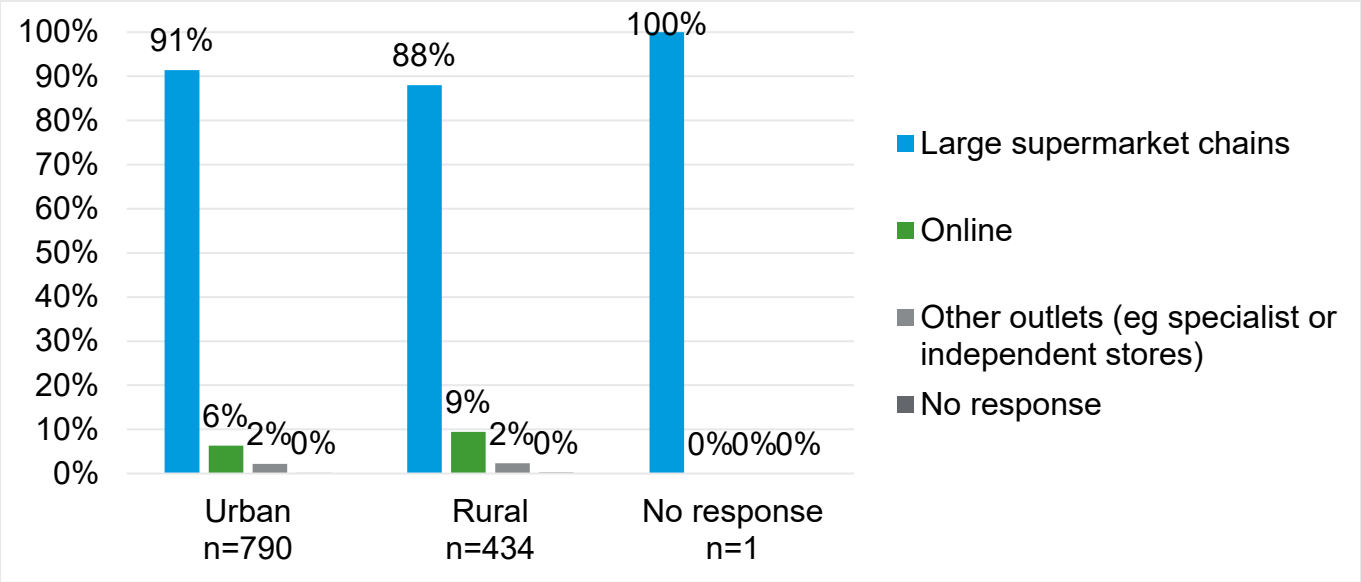


Figure 13: Shopping preferences of people living with FHS broken down by education status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

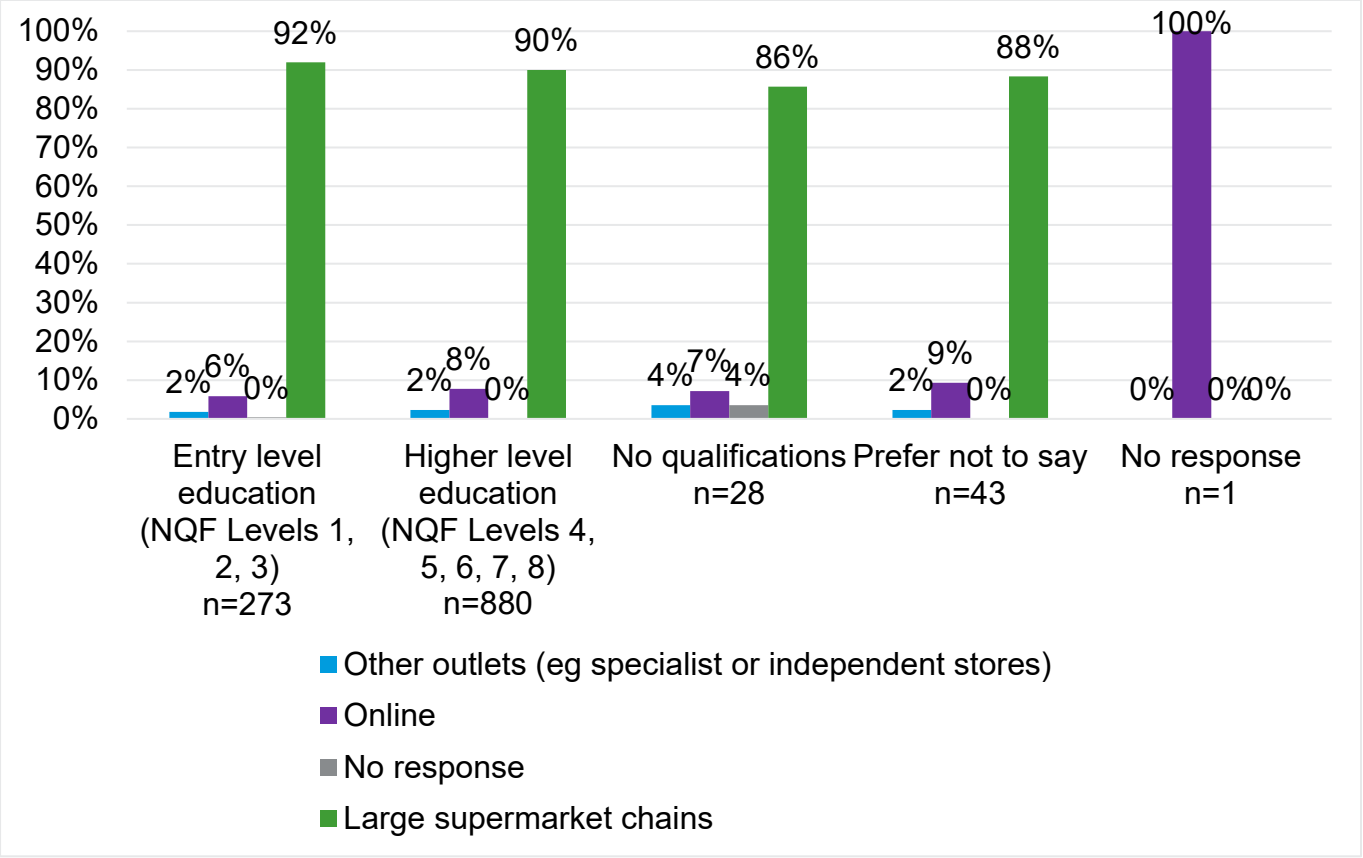


Figure 14: Shopping preferences of people living with FHS broken down by economic status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England,

Northern Ireland, and Wales between November 2020 and January 2021

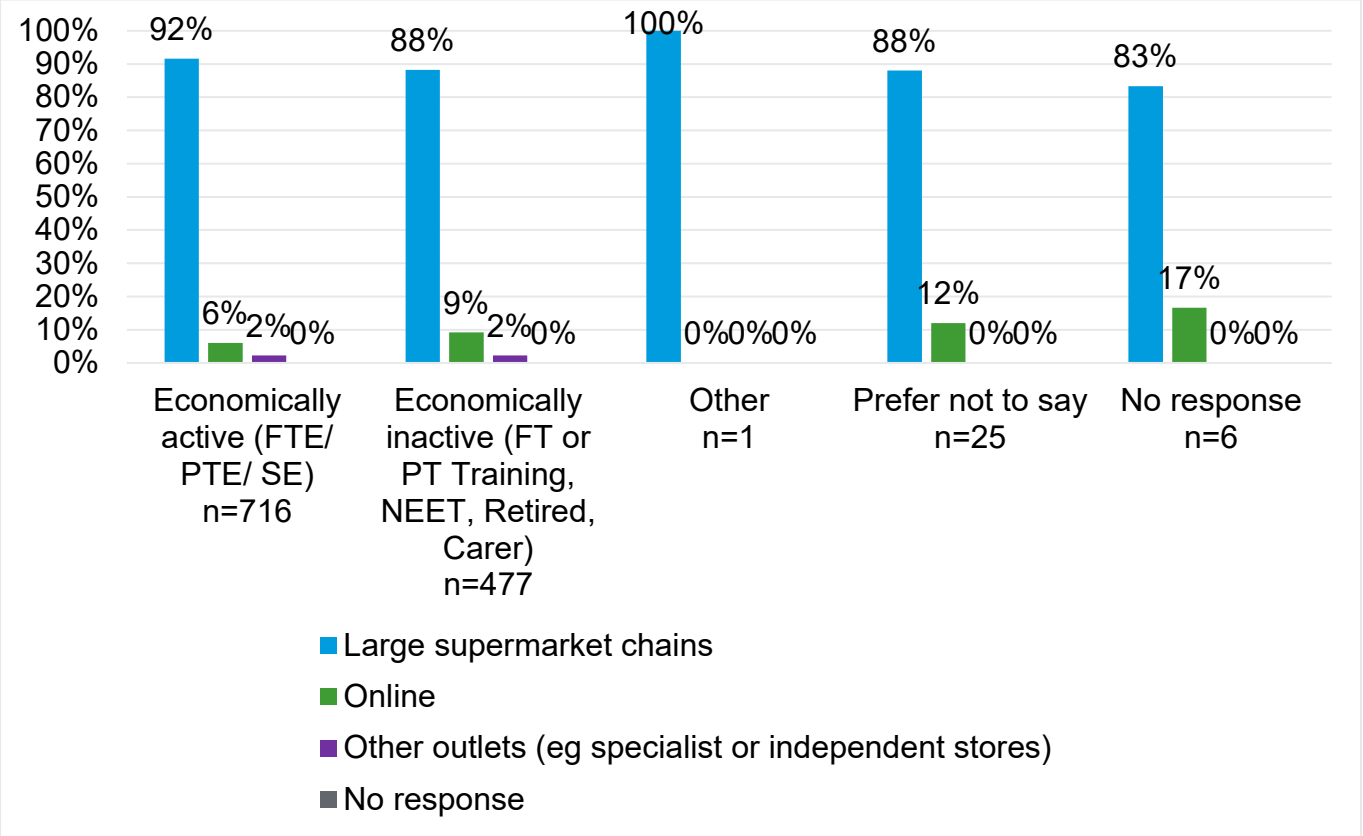
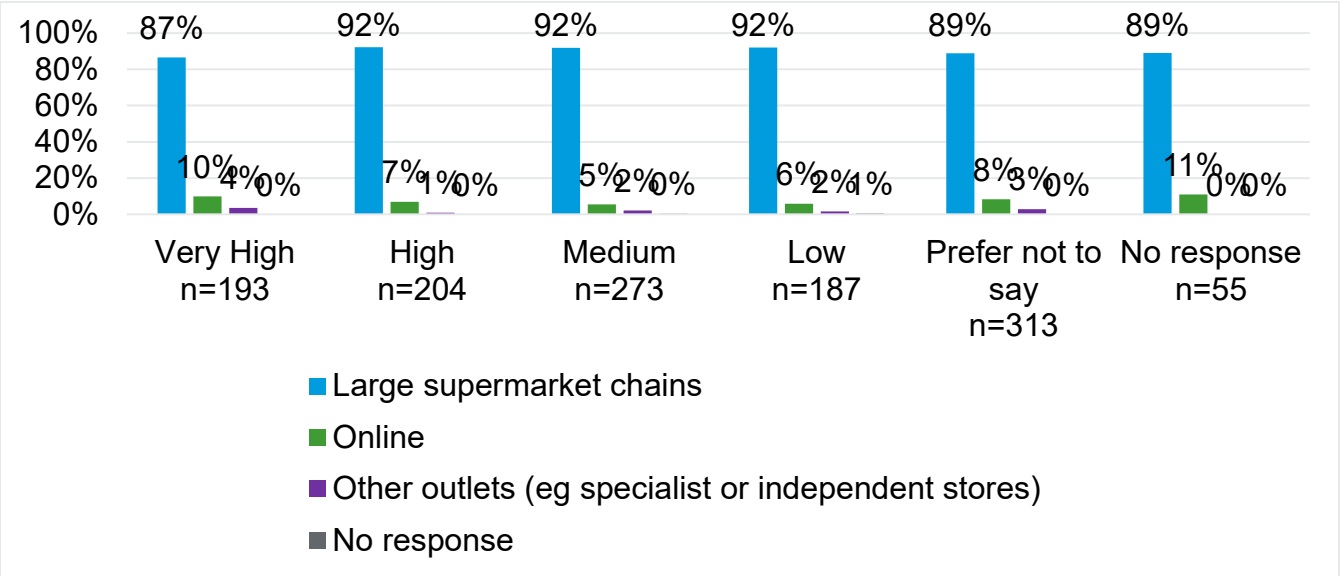


Figure 15: Shopping preferences of people living with FHS broken down by household income of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Additional shops to buy food due to FHS

Figures below indicate whether people living with FHS have to do additional shops to buy food cross tabulated by FHS cohort. This question allowed to choose multiple answers and the graphs indicate how frequently each shopping option was chosen.

Figure 16: Additional shops required by people living with FHS to buy food broken down broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

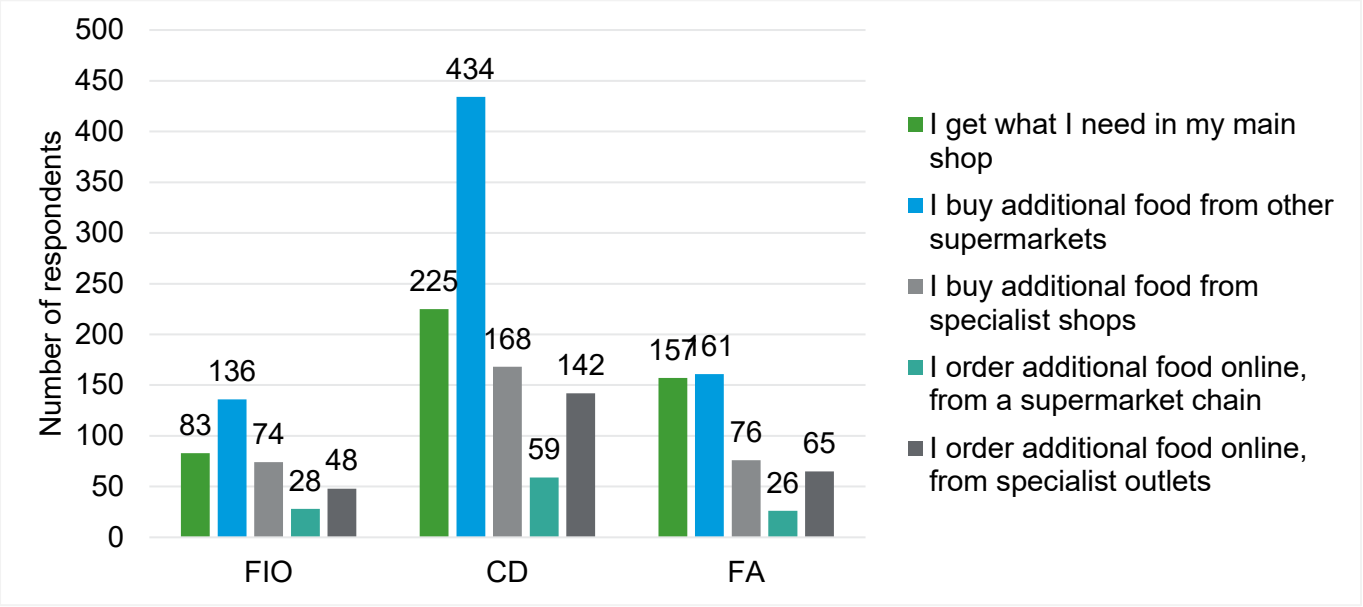


Figure 17: Spend on food & non-alcoholic drinks per week in shops and supermarkets (£) by people living with FHS broken down by FHS group from FHS online survey (based on 99% of the sample used in the analysis, n=1,223 as two observations did not have any spending) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

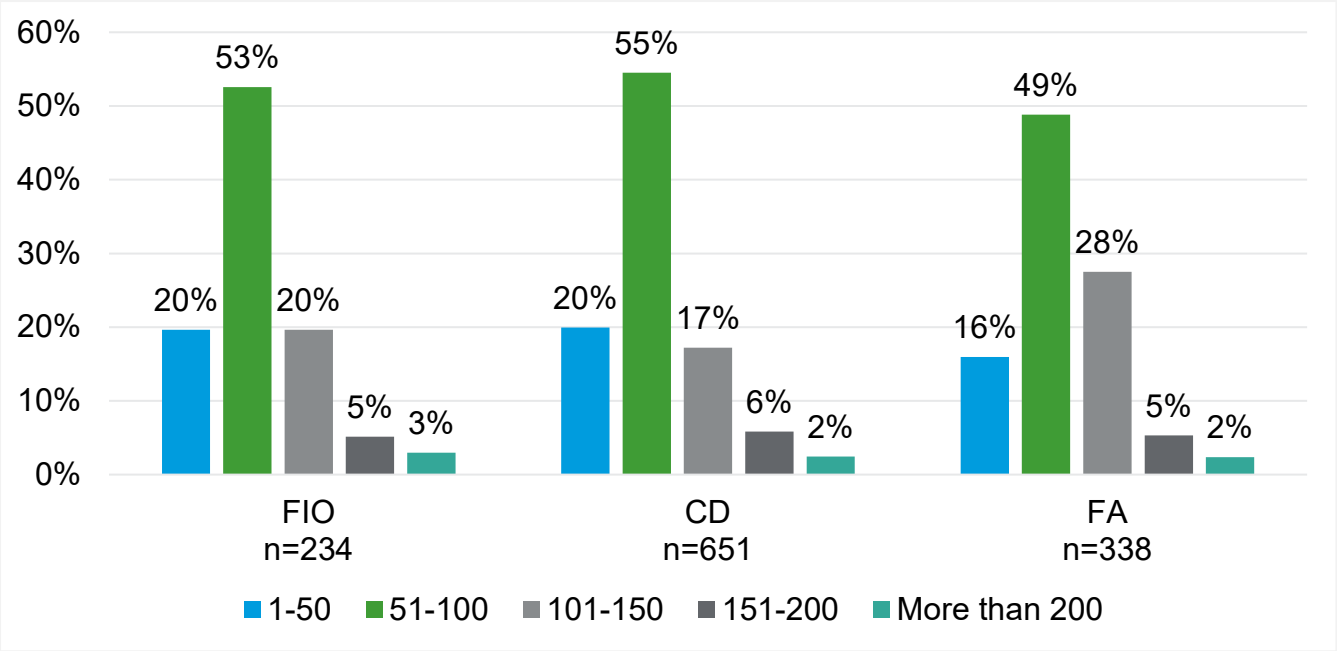
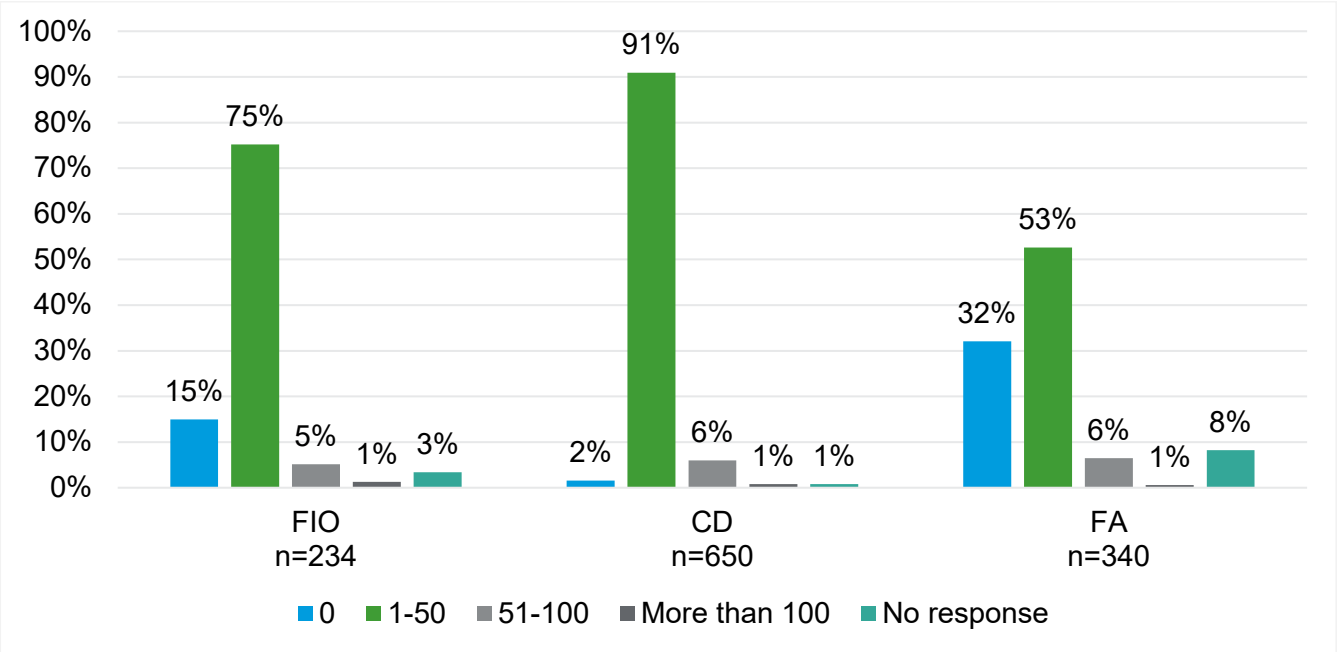


Figure 18: Spend on allergen-free food product equivalents per week in shops and supermarkets (£) by people living with FHS broken down by FHS group from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation was not admissible) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

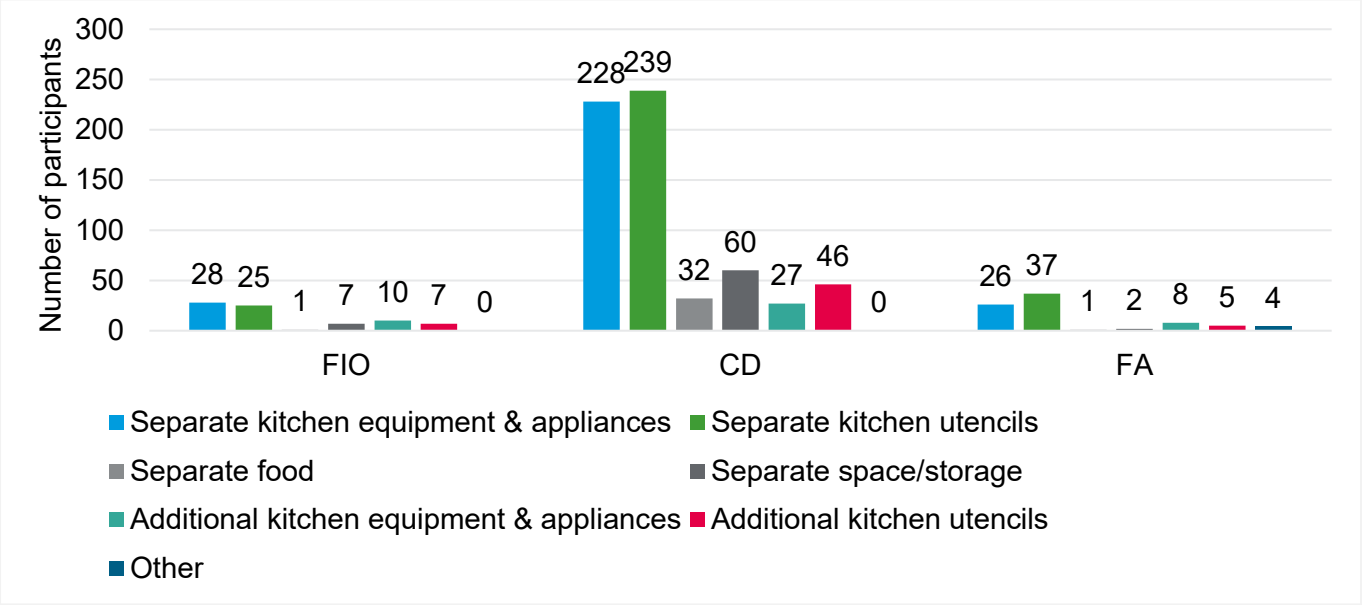


*** one observation was not admissible so sample size was 1,224**

Additional equipment for cooking

Figure below indicates whether people living with FHS need additional equipment for cooking allergen free foods cross tabulated by FHS cohort. This question invited free text, which was then coded in the categories used in the graph. As multiple options were provided by some participants, the graph shows how frequently each additional equipment option was indicated by respondents.

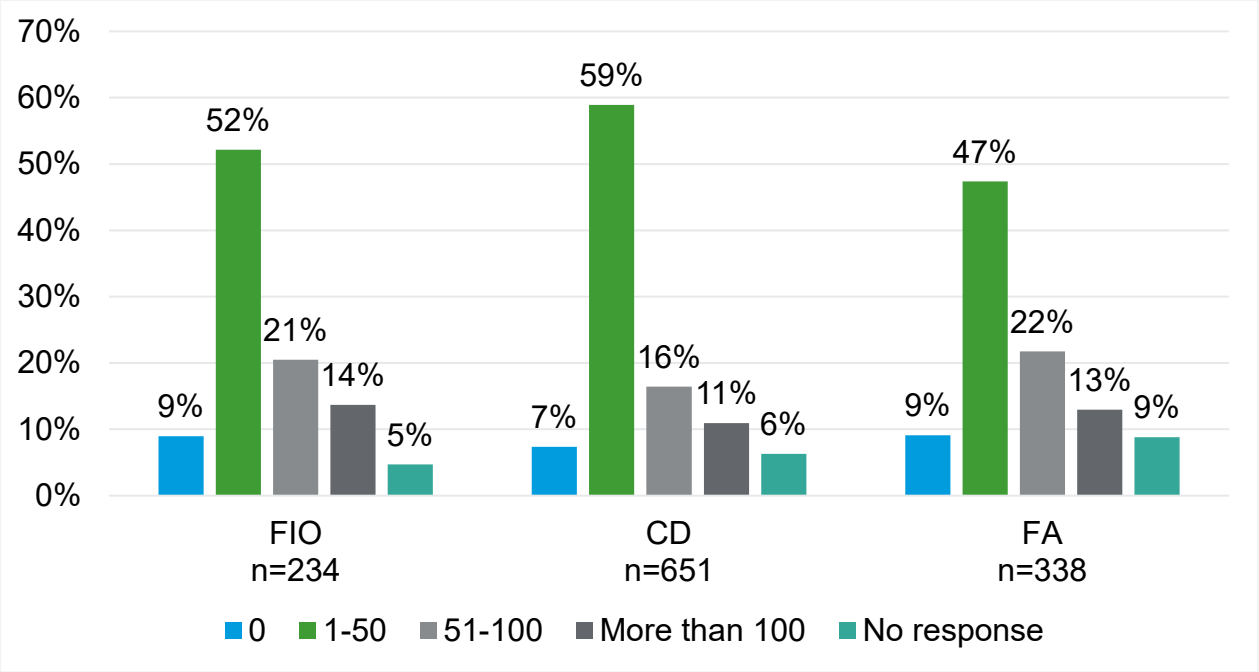
Figure 19: Additional equipment for preparing / cooking allergen free foods required by people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Eating out/takeaways

The figure below shows how much people living with FHS spend on eating out take-aways per month cross tabulated by FHS cohort.

Figure 20: Spend on eating out / takeaways per month (£) by people living with FHS broken down by FHS group from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation was not admissible) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Price comparison of a meal of people living with FHS vs people living without FHS

The below graphs present the responses of people living with FHS to the following question: On average, how would you say the price of your meal compares to those without a food hypersensitivity when you eat out? These responses are cross tabulated by FHS group, education status, economic status, urban / rural location, and household income variables.

Figure 21: Perception of people living with FHS of the price comparison of a meal for people living with FHS vs people living without FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

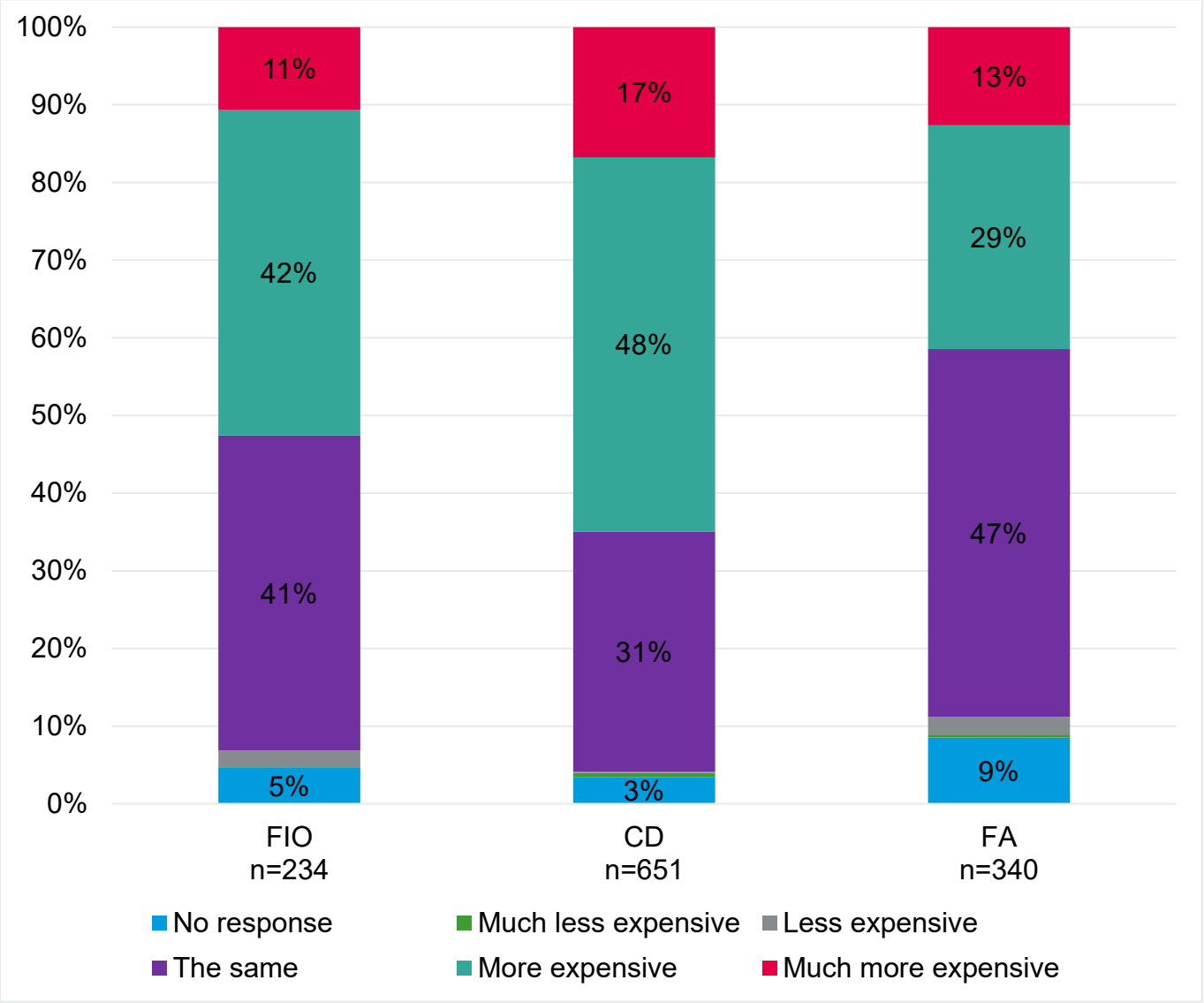


Figure 22: Perception of people living with FHS of the price comparison of a meal for people living with FHS vs people living without FHS broken down by urban / rural location of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

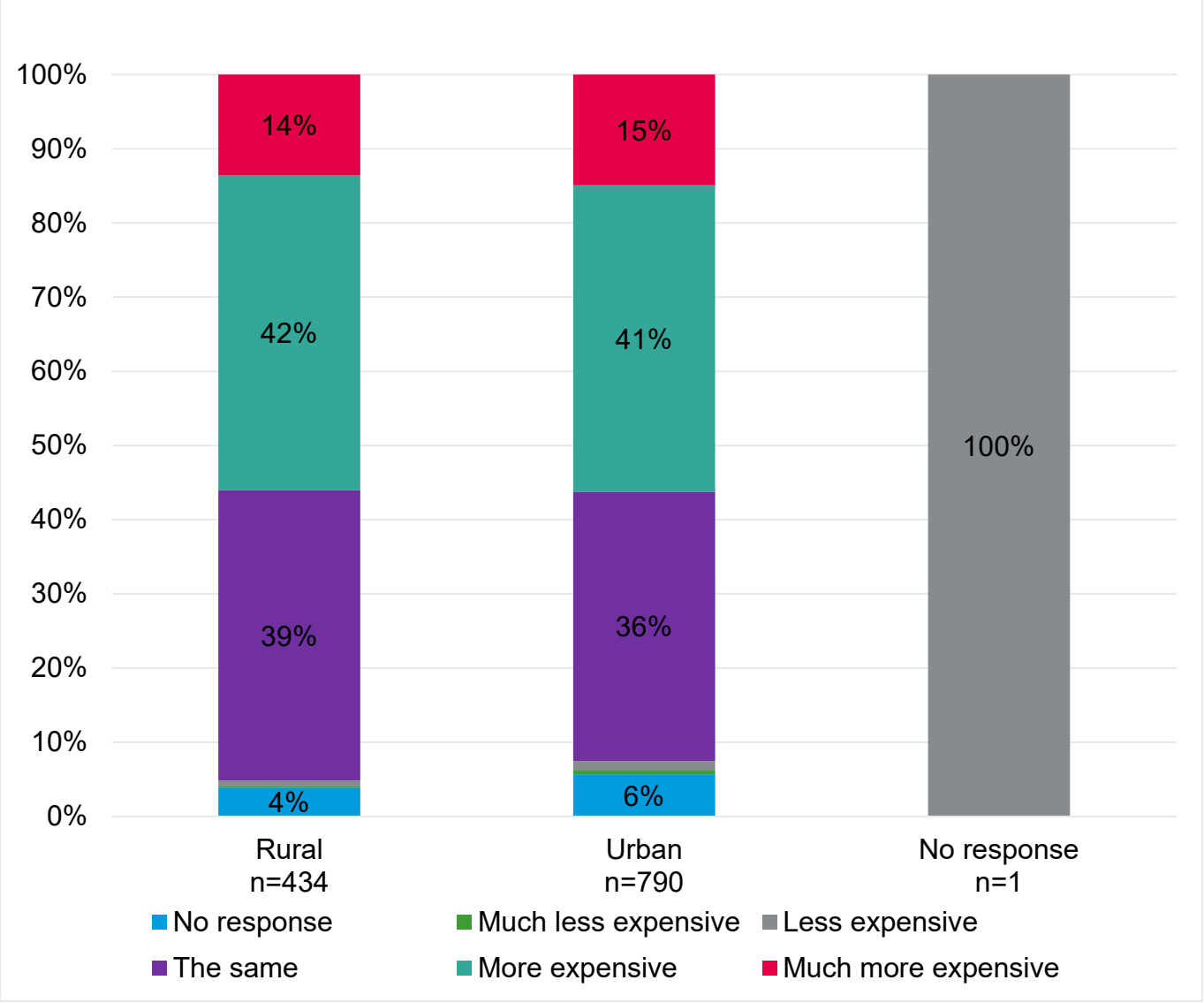


Figure 23: Perception of people living with FHS of the price comparison of a meal for people living with FHS vs people living without FHS broken down by education status of person living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

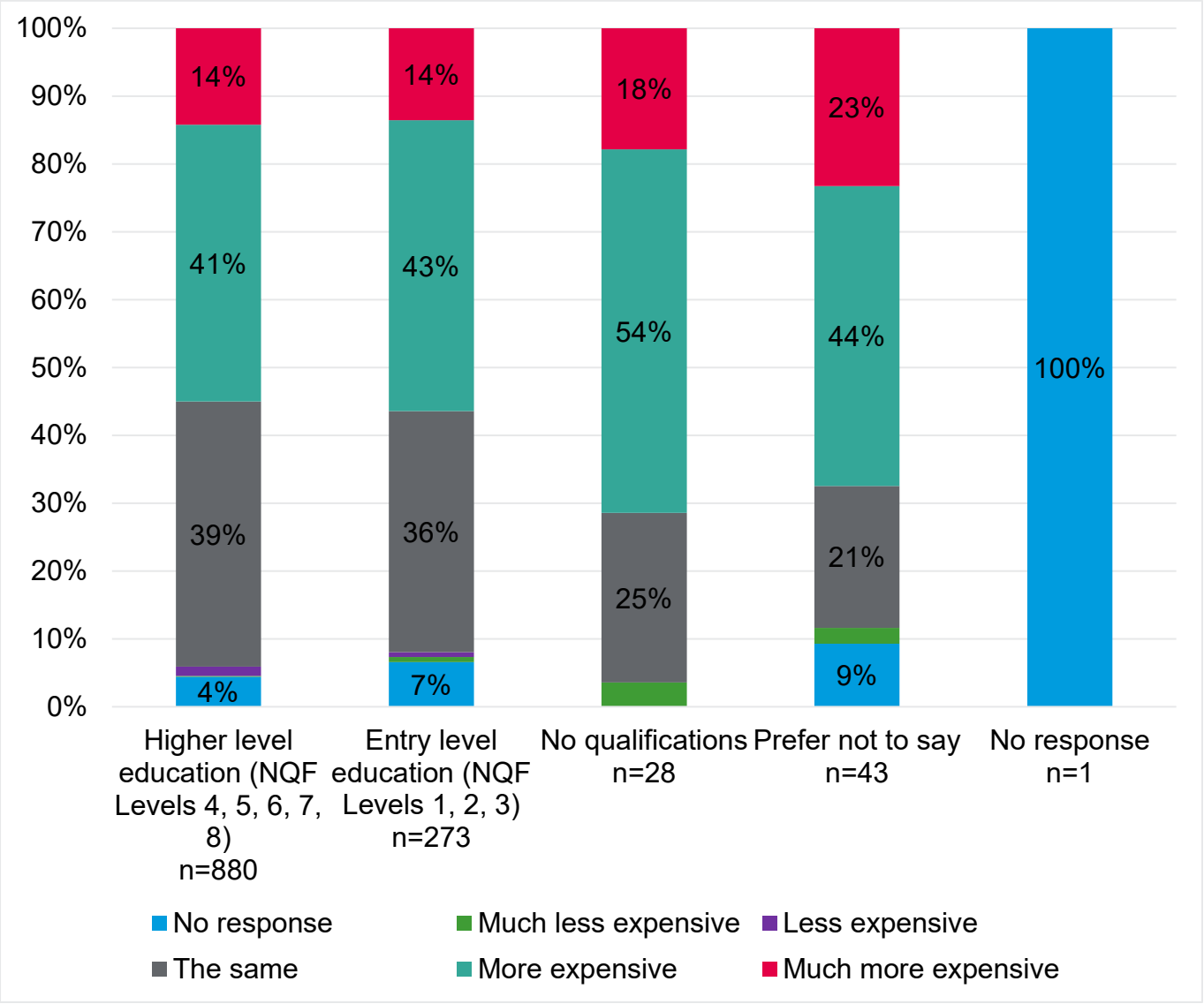


Figure 24: Perception of people living with FHS of the price comparison of a meal for people living with FHS vs people living without FHS broken down by economic status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

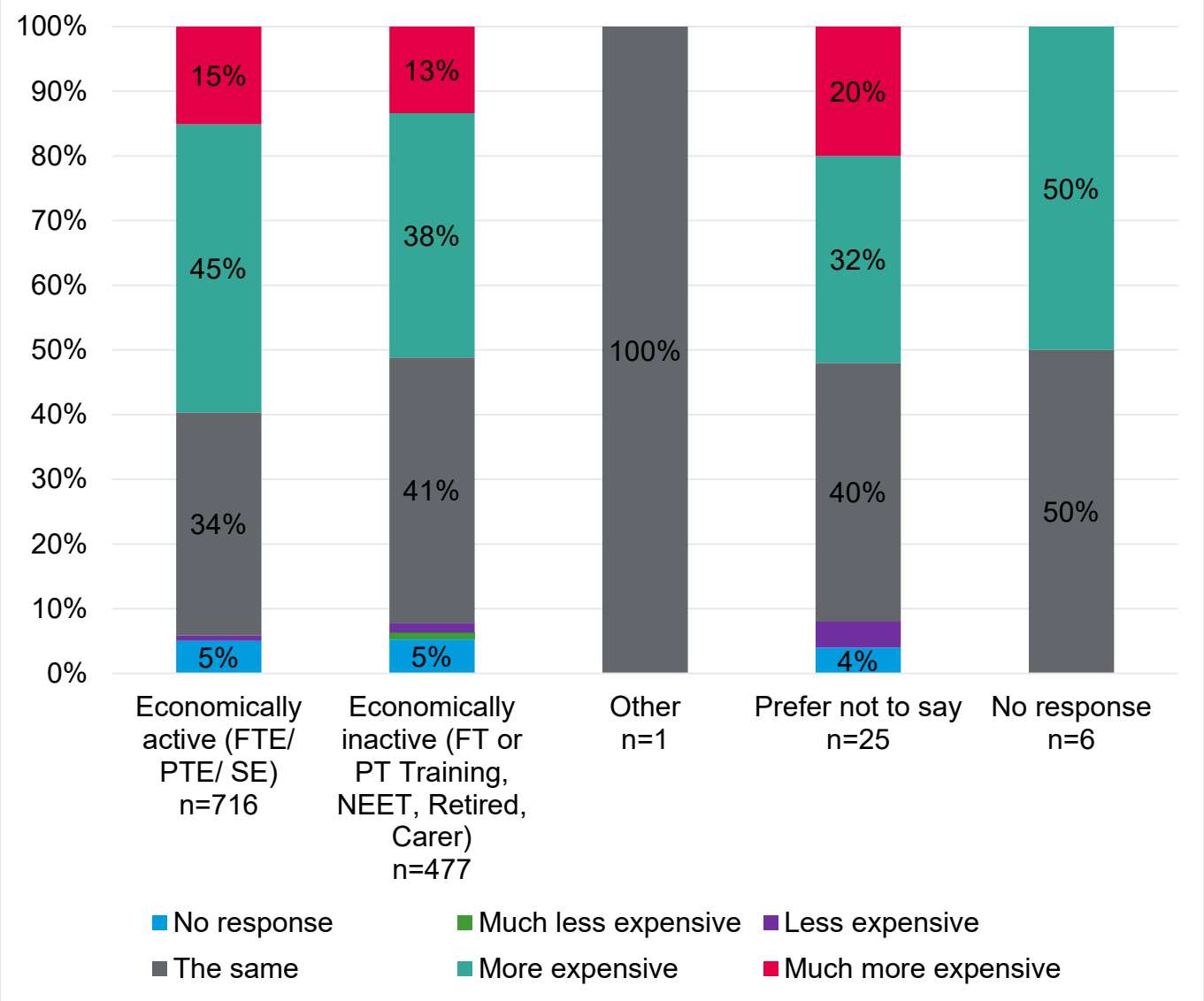
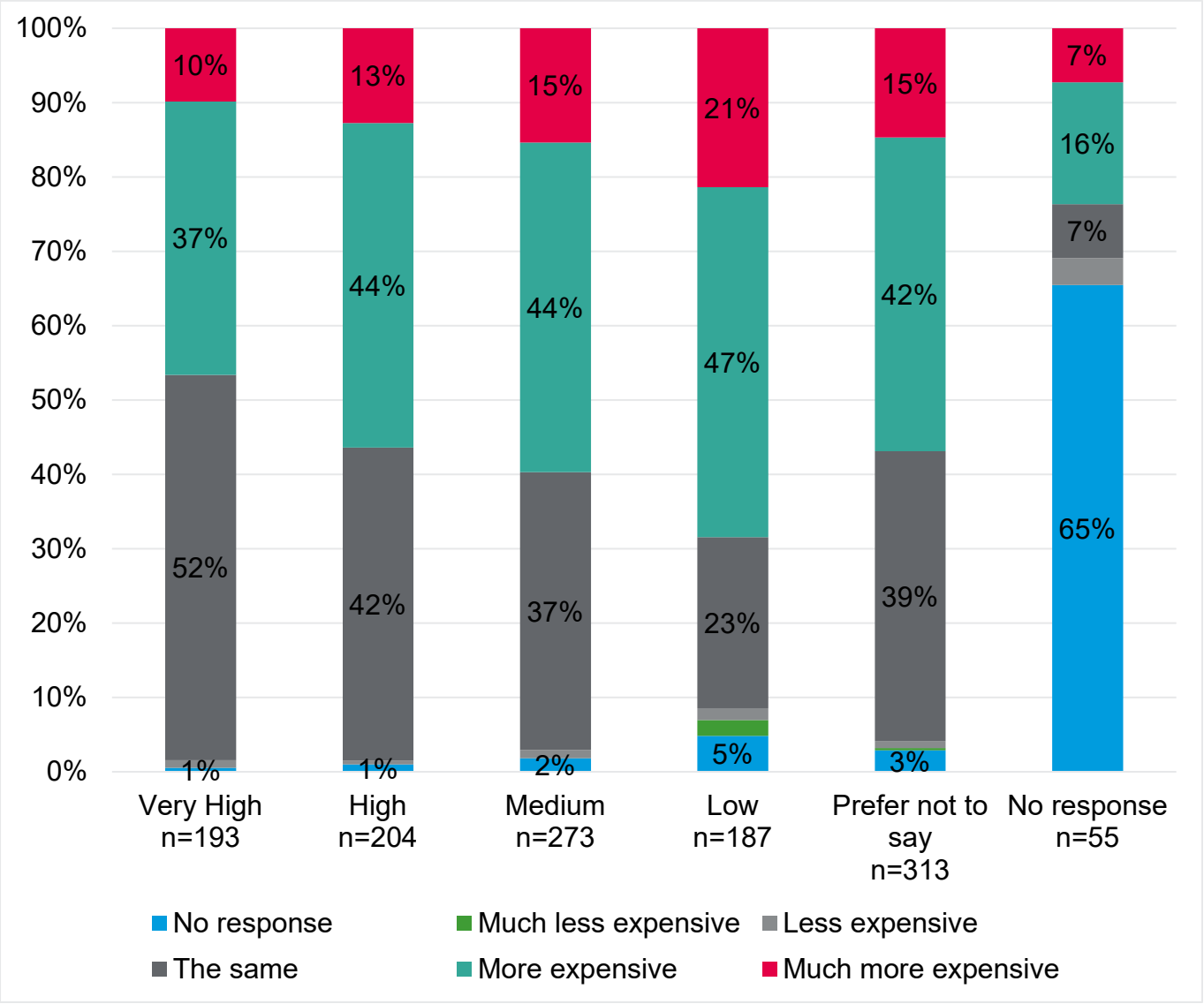


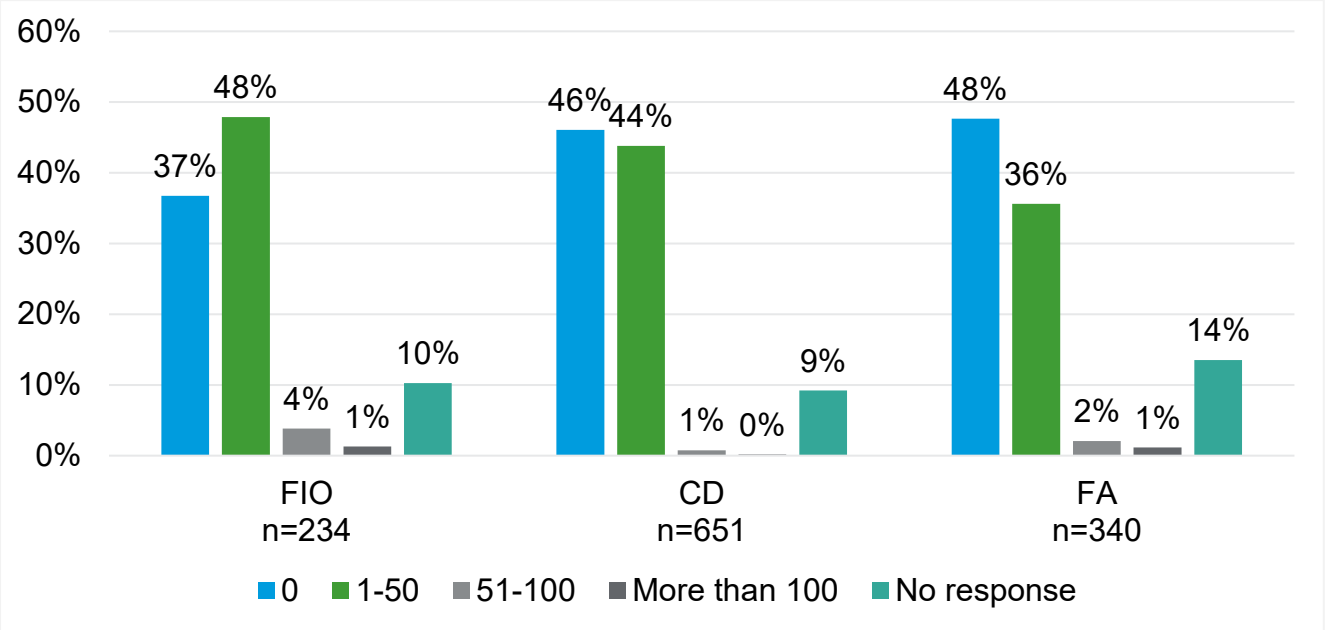
Figure 25: Perception of people living with FHS of the price comparison of a meal for people living with FHS vs non-people living with FHS broken down by household income of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Nutritional supplements / OTC medicines

The graph below indicates how much per month people living with FHS spend on nutritional supplements / OTC medicines cross tabulated by FHS group.

Figure 26: Spend on nutritional supplements / OTC medicines per month (£) by people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Prescriptions

The graphs below show how much people living with FHS spend on prescription medication and on food on prescription per month, cross-tabulated by FHS group.

Figure 27: Spend on prescription medication (e.g. adrenaline auto-injectors, anti-histamines, corticosteroids) per month (£) by people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

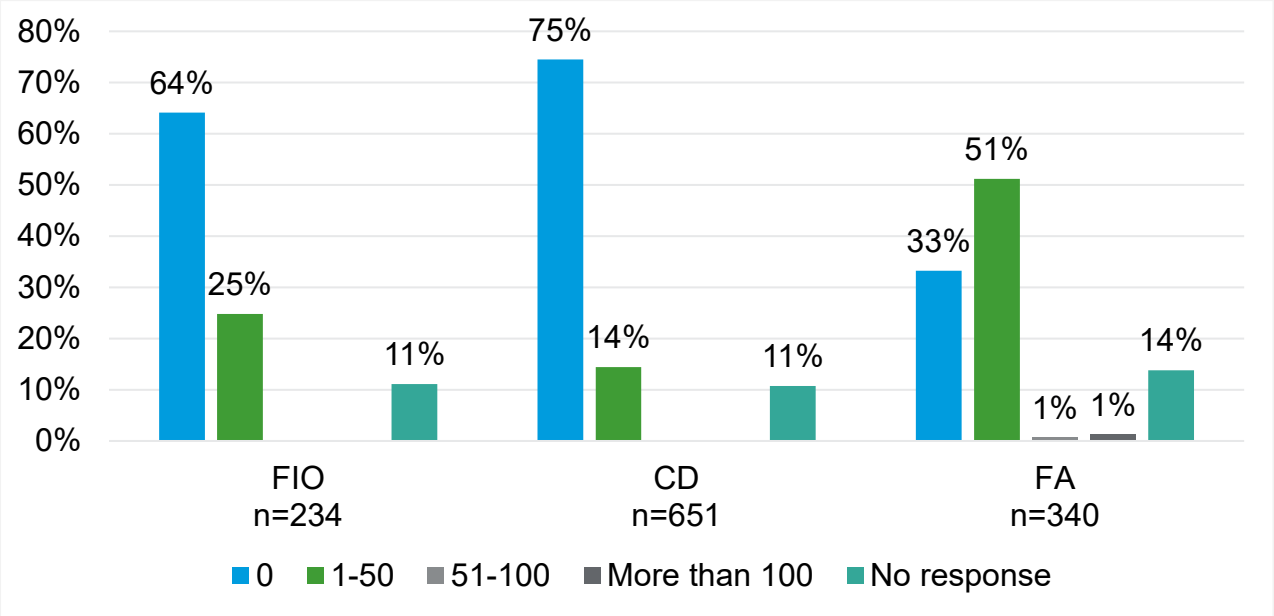
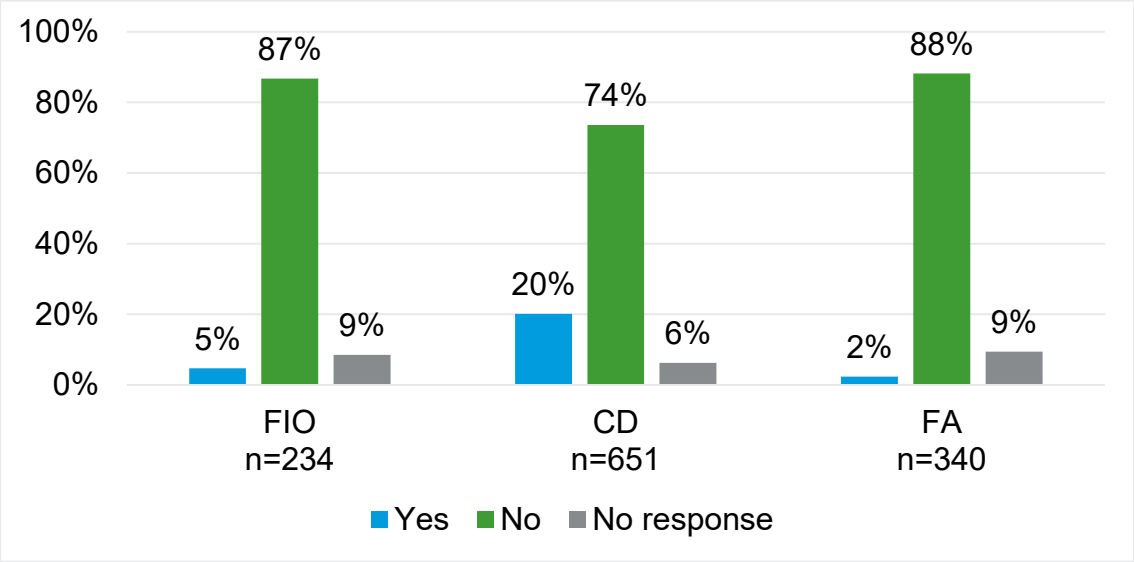


Figure 28: Food on prescription received by people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales be-tween November 2020 and January 2021



The graphs below indicate how much per month people living with FHS spend on food on prescription stratified by those that responded “No” and “Yes” to whether FHS households currently receive food on prescription. There are 93 “No responses” not included below. There is a small number of respondents who responded “No” but indicated a positive cost of food on prescription. Conversely, there is a large number of respondents who responded “Yes” but indicated they spent zero pounds on food on prescription.

Figure 29: Food on prescription costs (£ p/m) incurred by people living with FHS broken down by FHS group from FHS online survey (based on 80% of the sample used in the analysis, n=982, those who responded “No” to the previous question) conducted in England, Northern Ireland, and Wales be-tween November 2020 and January 2021

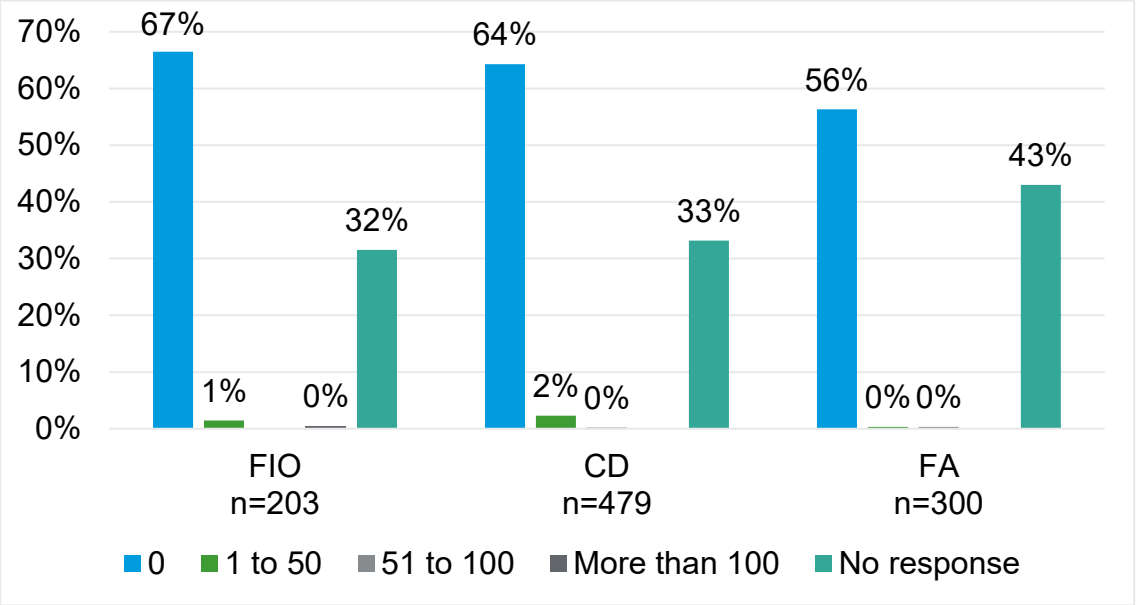
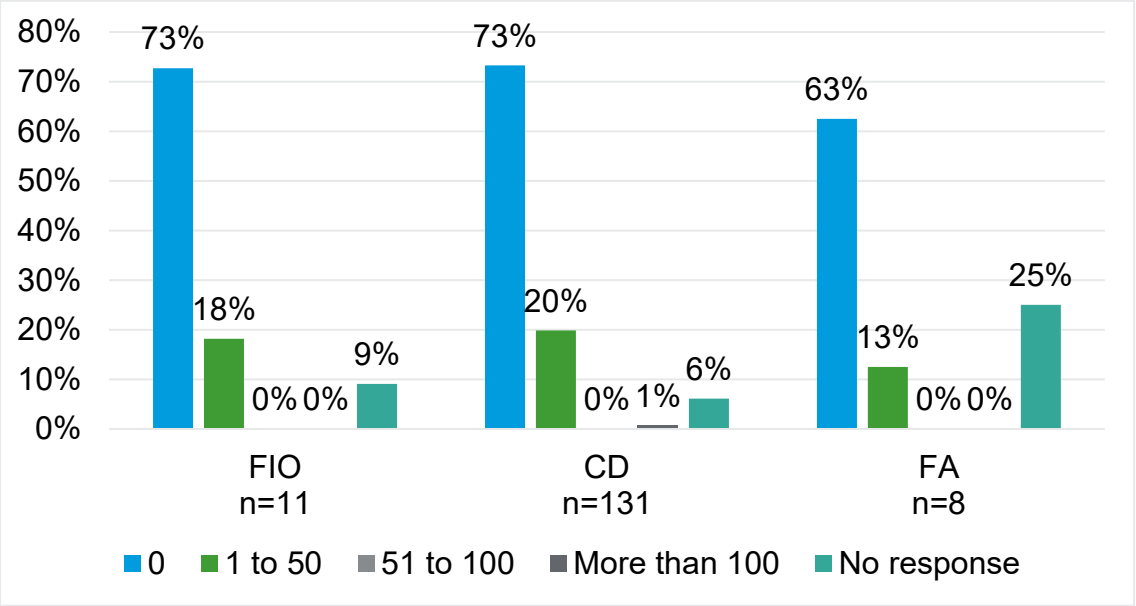


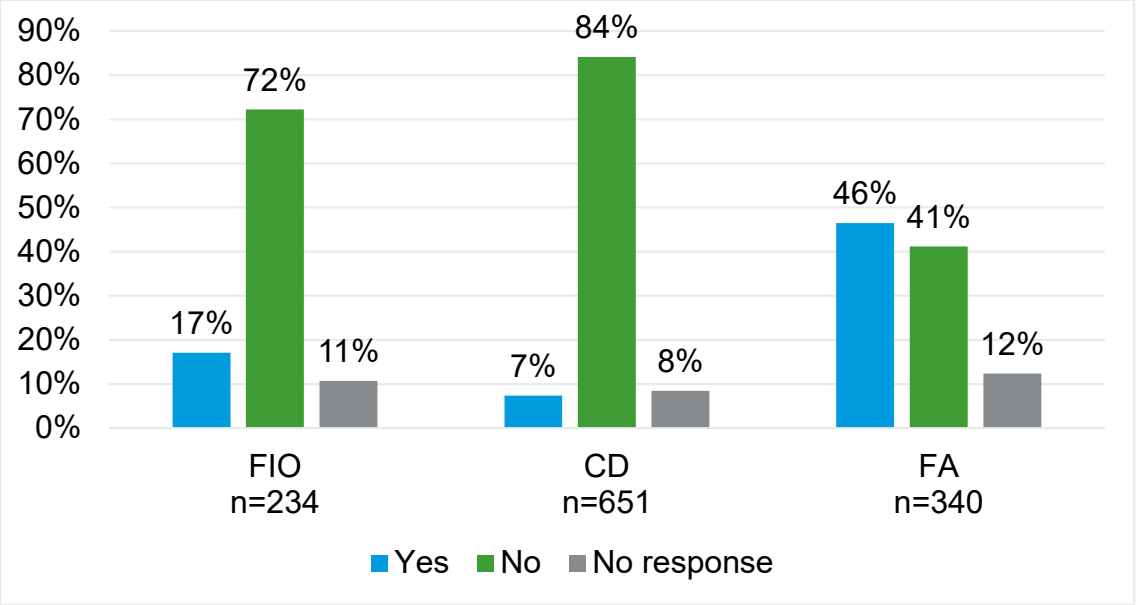
Figure 30: Food on prescription costs (£ p/m) incurred by people living with FHS broken down by FHS group from FHS online survey (based on 12% of the sample used in the analysis, n=150, those who responded "Yes" to the previous question) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Additional specialist equipment for FHS

Figure below shows whether people living with FHS require any additional equipment to manage their FHS cross tabulated by FHS cohort.

Figure 31: Whether any additional specialist equipment was required by people living with FHS to manage their FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales be-tween November 2020 and January 2021



The graphs below indicate how much per year people living with FHS spend additional equipment to manage FHS stratified by those that responded “No” and “Yes” to whether people living with FHS require any additional equipment. There are 122 “No responses” not included below. There is a small number of respondents who responded “No” but indicated a positive spend on additional equipment. Conversely, there are some respondents who responded “Yes” but indicated they spent zero on additional equipment.

Figure 32: Specialist or additional equipment costs (£ p/y) incurred by people living with FHS broken down by FHS group from FHS online survey (based on 70% of the sample used in the analysis, n=857, those who responded "No" to the previous question) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

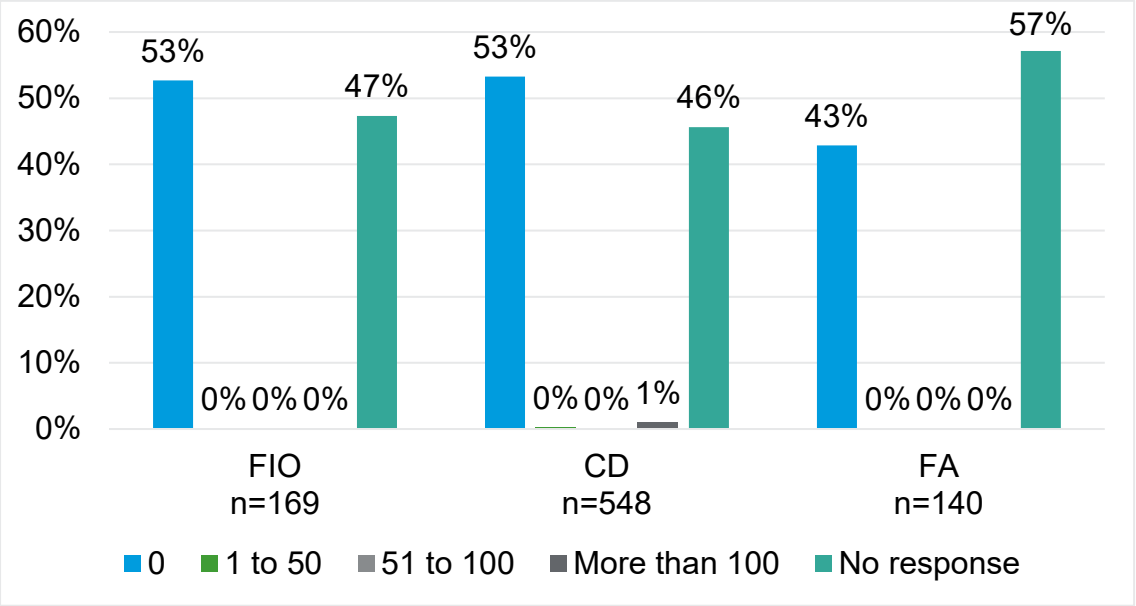
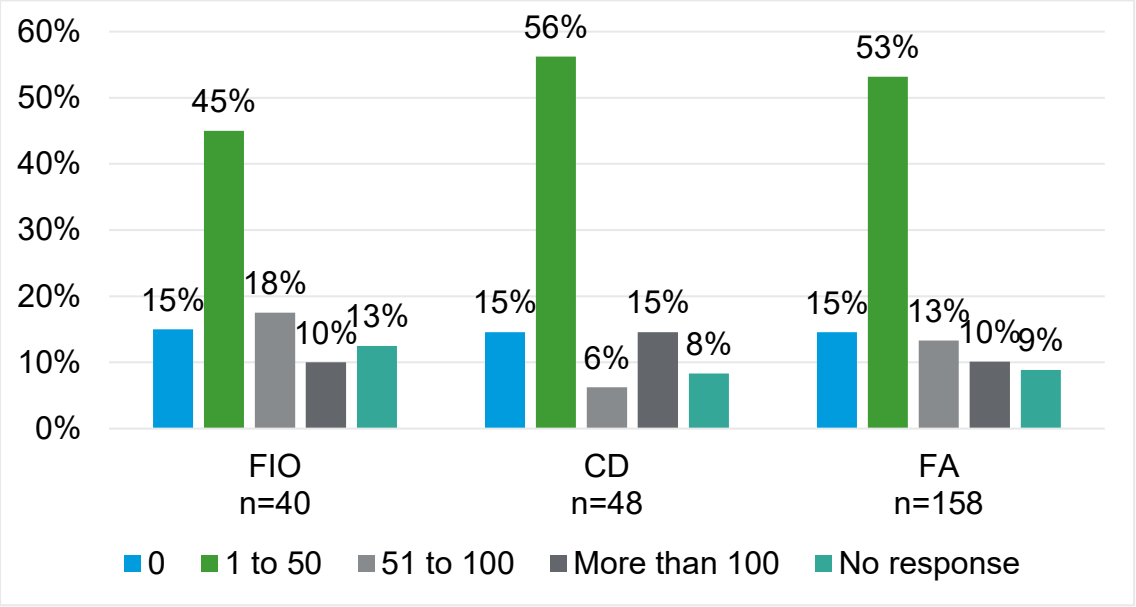


Figure 33: Specialist or additional equipment costs (£ p/y) incurred by people living with FHS broken down by FHS group from FHS online survey (based on 20% of the sample used in the analysis, n=246, those who responded "Yes" to the previous question) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Private healthcare

Figures below indicate whether people living with FHS pay for any private healthcare due to FHS cross tabulated by FHS group, geography, education status, economic status, and household income variables.

Figure 34: Whether any private healthcare was required due to FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

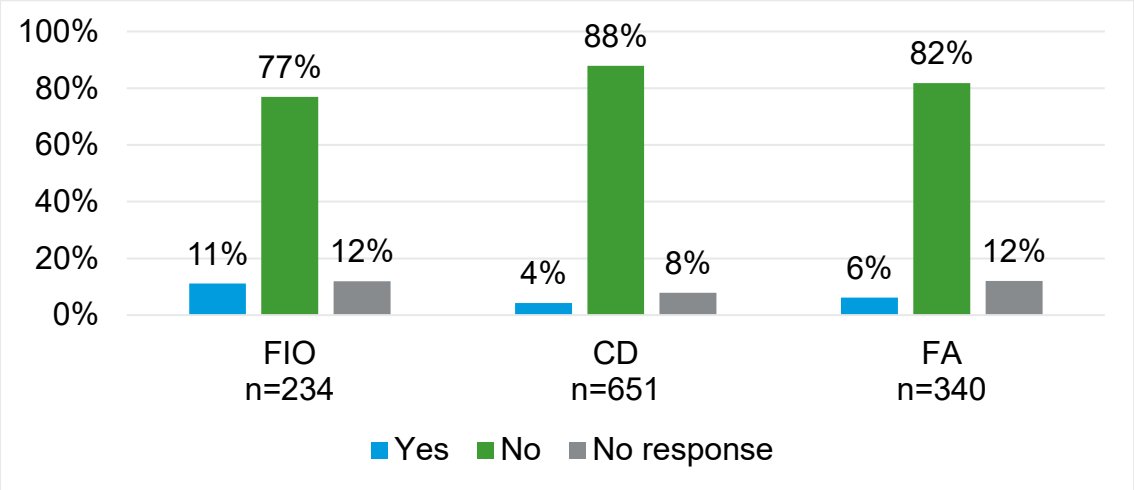


Figure 35: Whether any private healthcare was required due to FHS broken down by urban / rural location of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

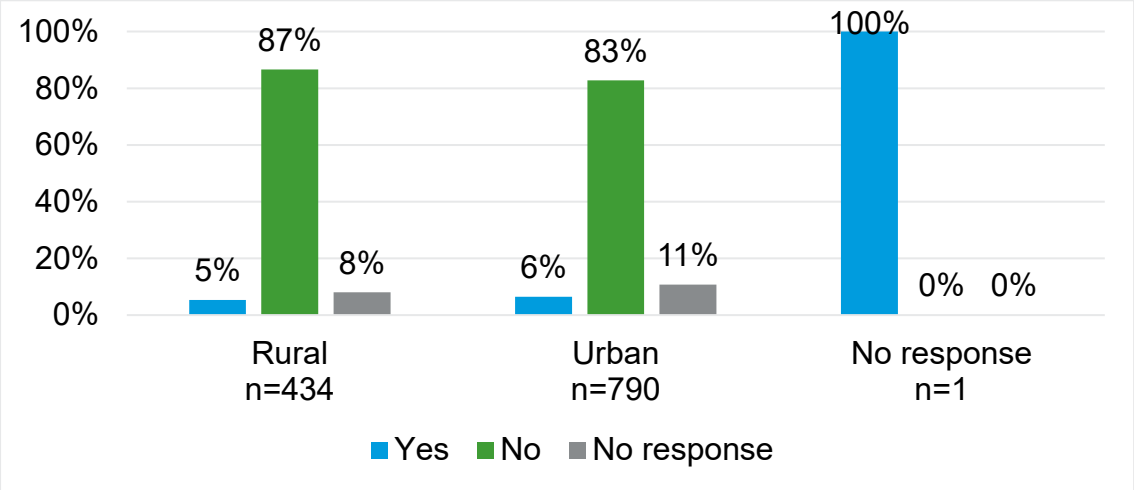


Figure 36: Whether any private healthcare was required due to FHS broken down by education status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

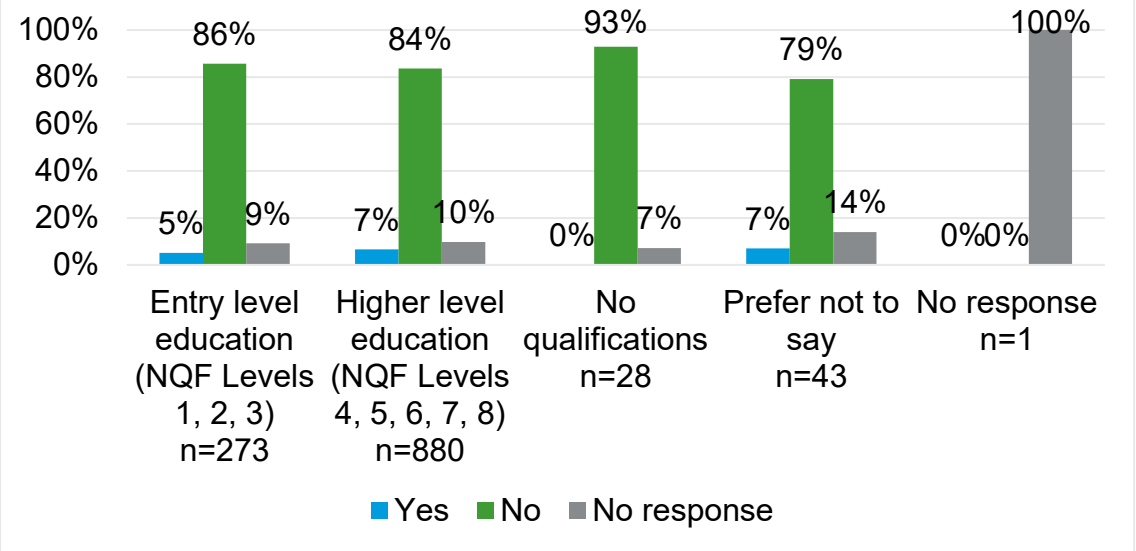


Figure 37: Whether any private healthcare was required due to FHS broken down by economic status of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

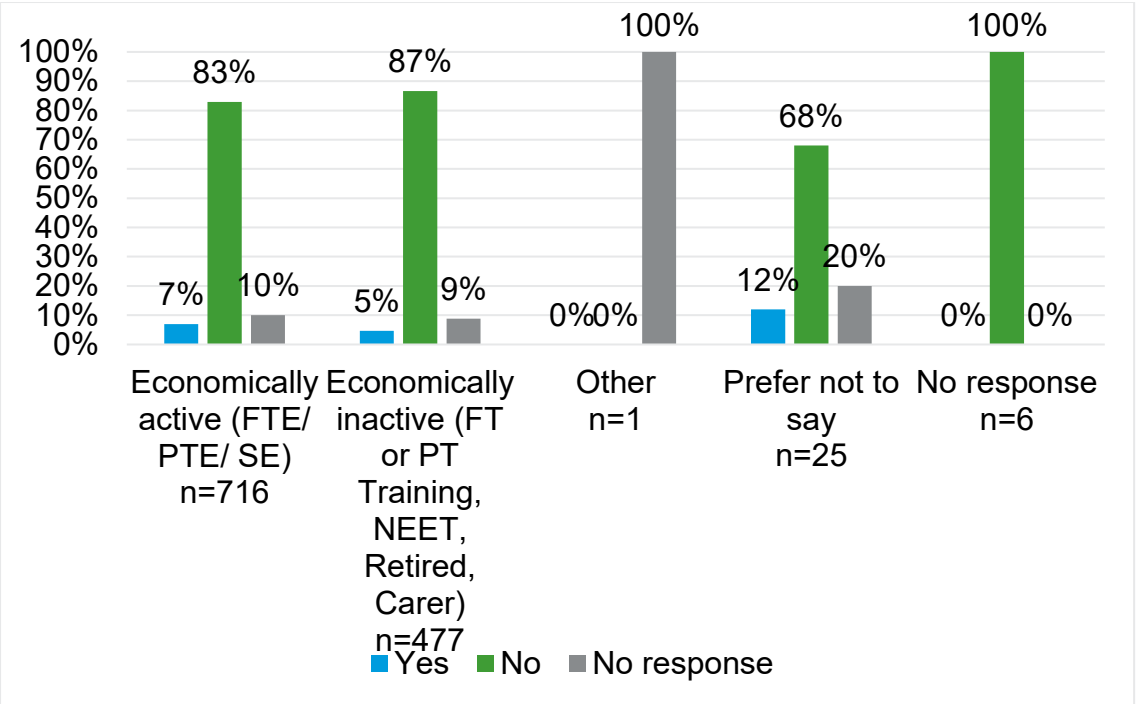
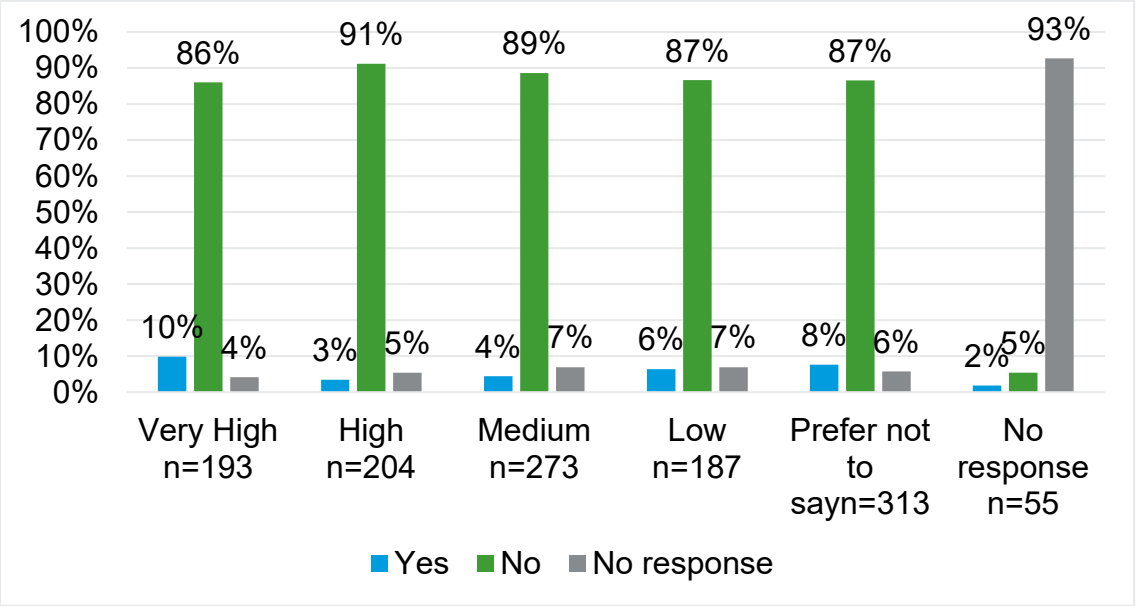


Figure 38: Whether any private healthcare was required due to FHS broken down by household income of people living with FHS from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Time spent shopping/planning FHS food purchases

The below graphs indicate how much time people living with FHS spend on shopping/ planning FHS food purchases in hours p/w as well as additional time spent on planning food shop and reading labels. Each question is cross tabulated by FHS cohort, geography, education status, economic status, and household income variables.

Figure 39: Time spent on shopping / planning FHS food purchases per week by people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

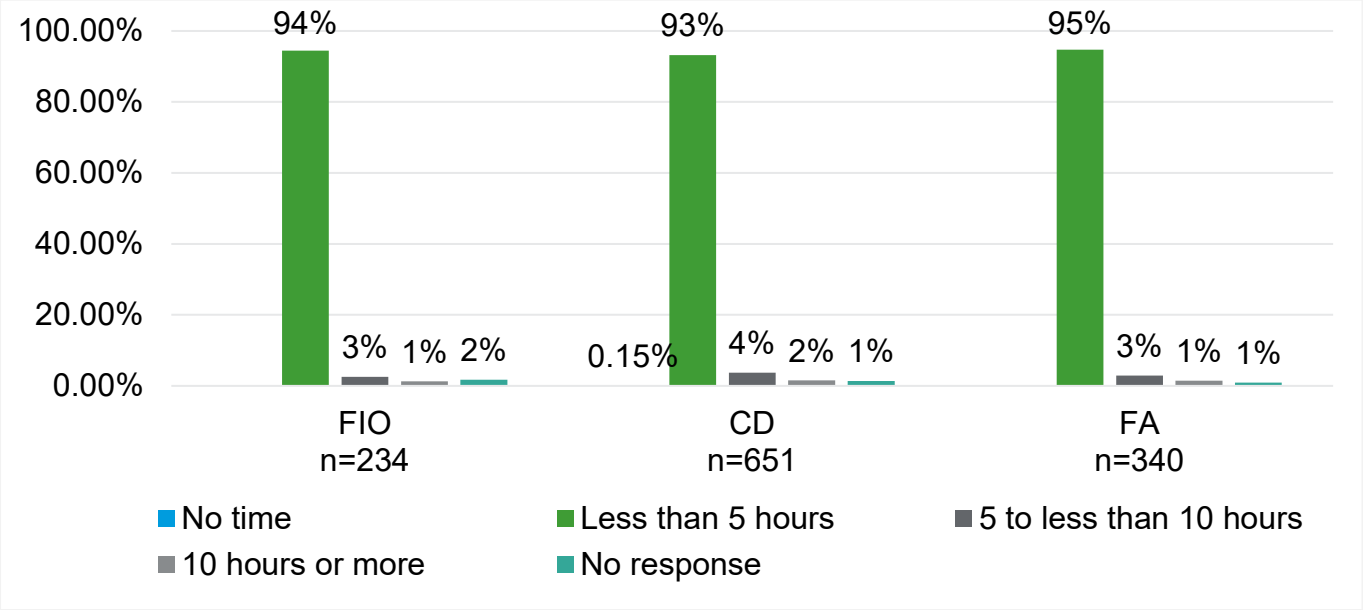


Figure 40: Additional time spent on planning food shop and checking / reading labels per week by people living with FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

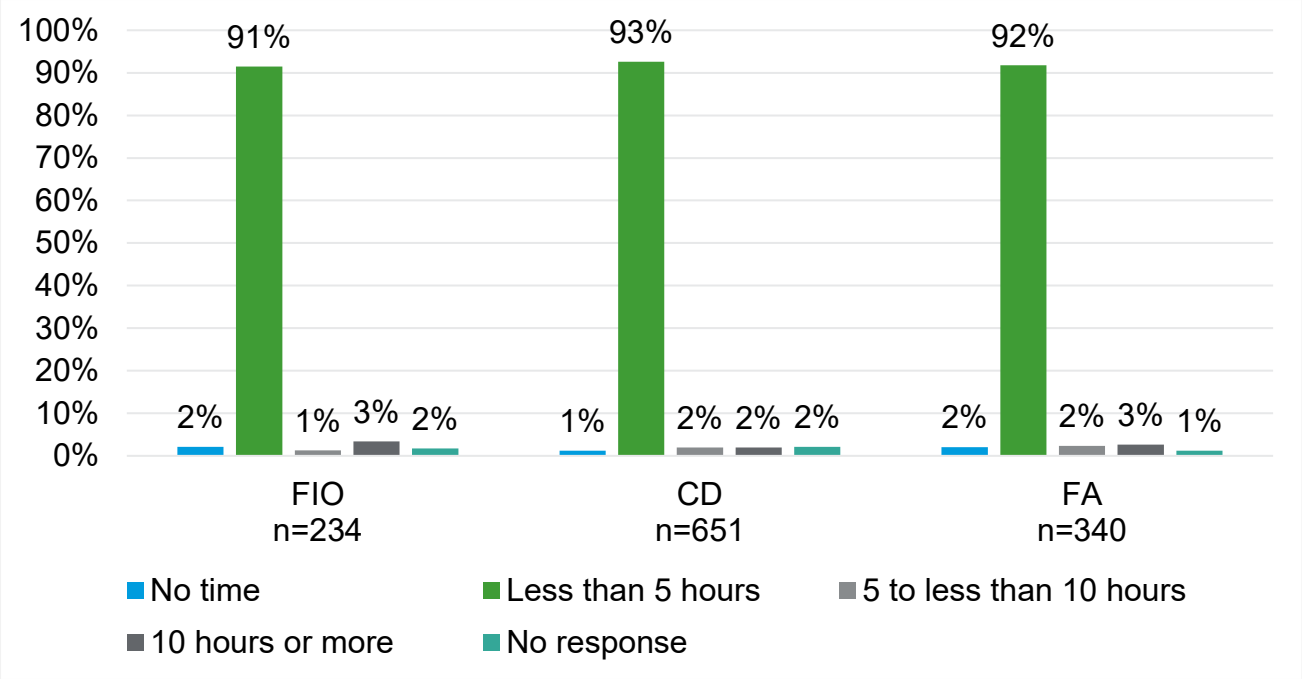


Figure 41: Time spent on shopping / planning FHS food purchases per week by people living with FHS broken down by geography from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

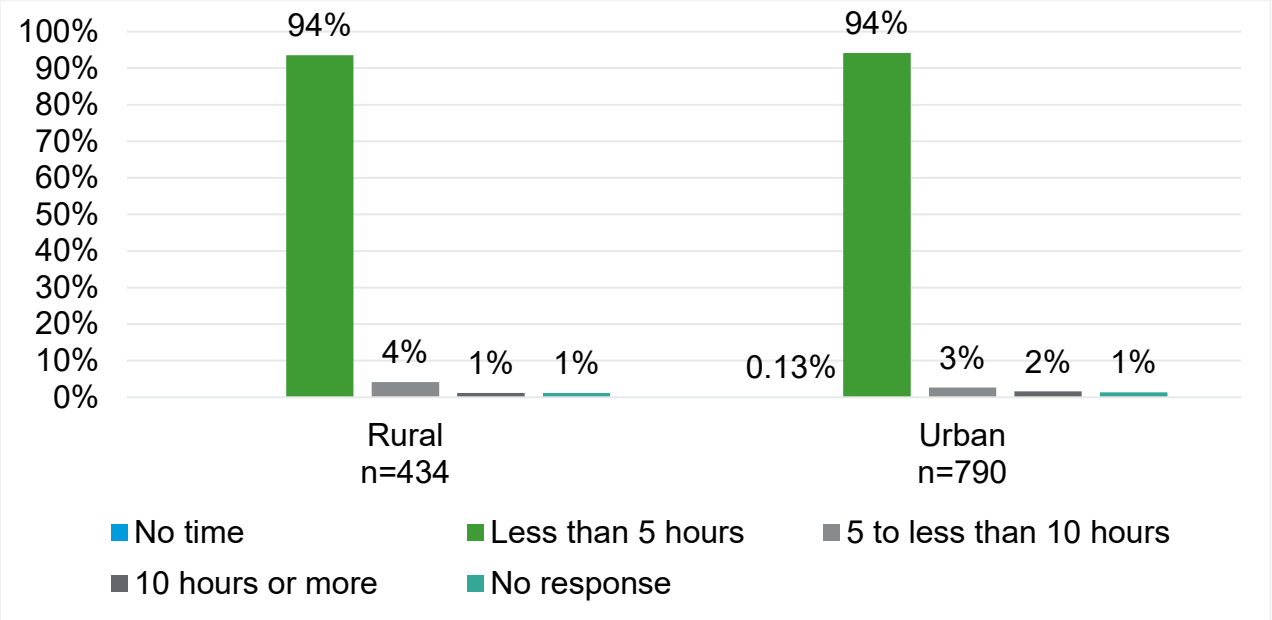


Figure 42: Additional time spent on planning food shop and checking / reading labels per week by people living with FHS broken down by geography from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

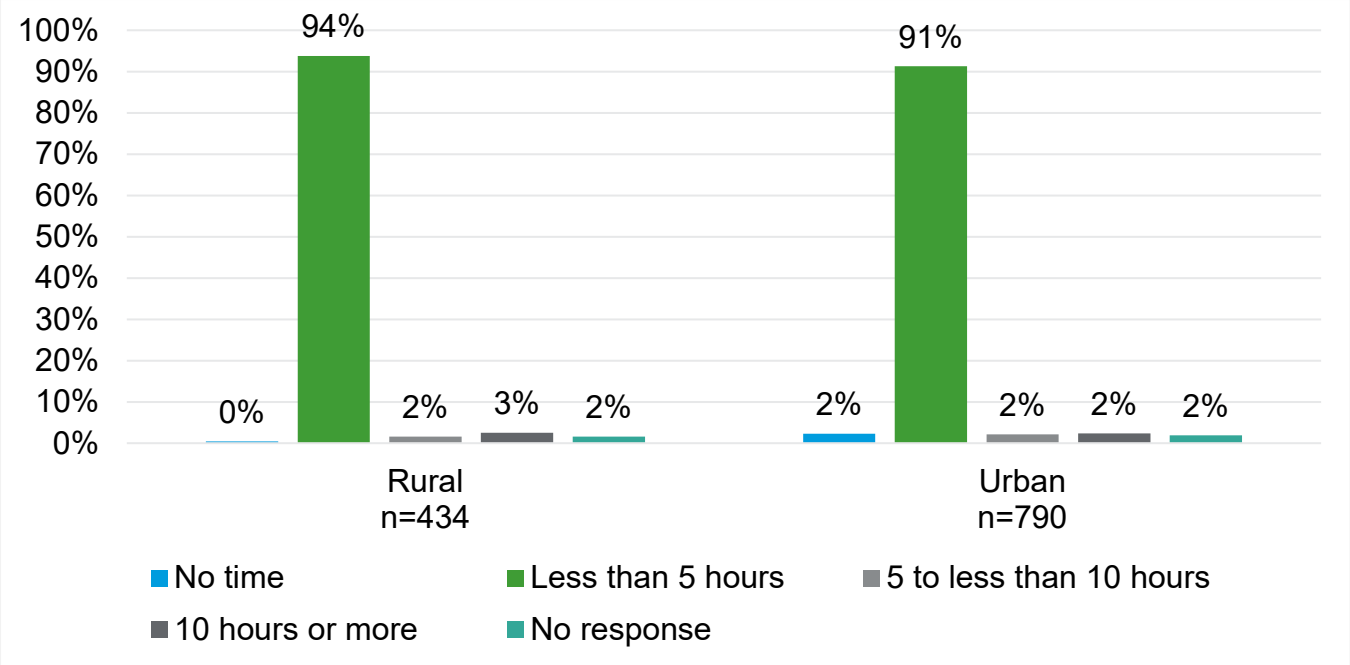


Figure 43: Time spent on shopping / planning FHS food purchases per week by people living with FHS broken down by education status from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation was Not Available) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

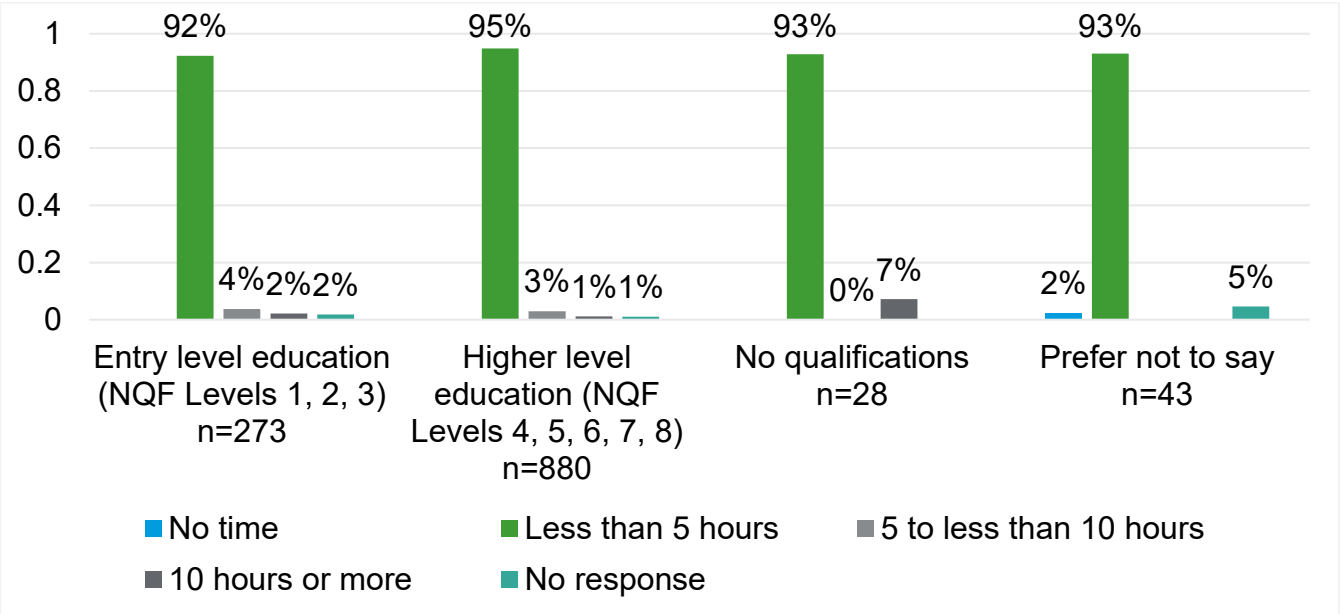


Figure 44: Additional time spent on planning food shop and checking / reading labels per week by people living with FHS broken down by education status from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation was Not Available) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

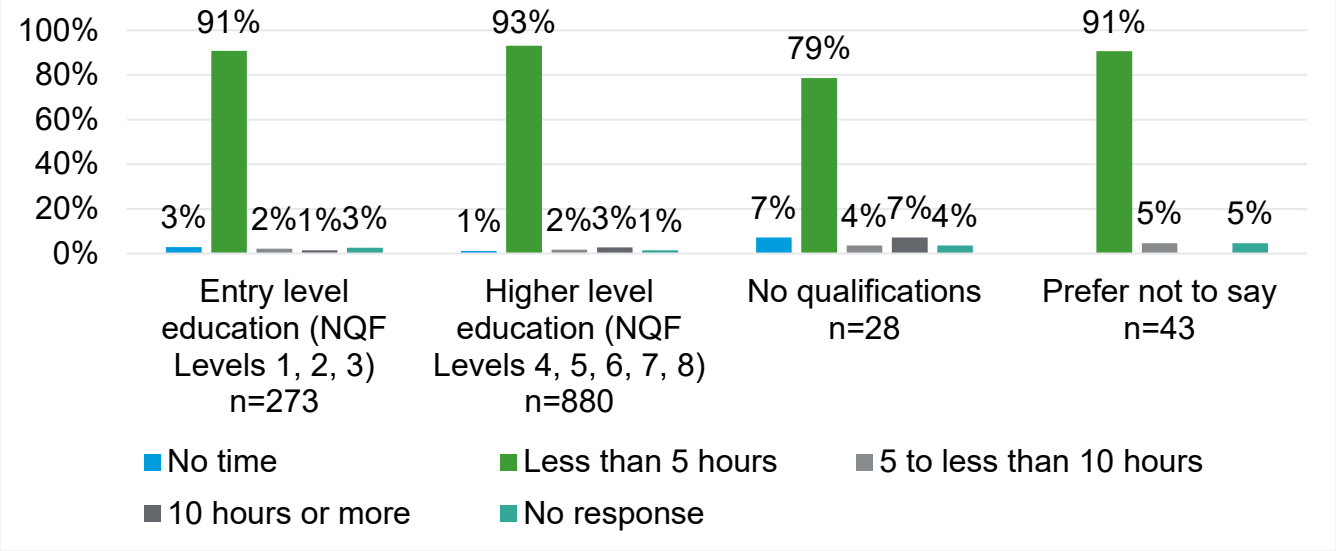


Figure 45: Time spent on shopping / planning FHS food purchases per week by people living with FHS broken down by economic status from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

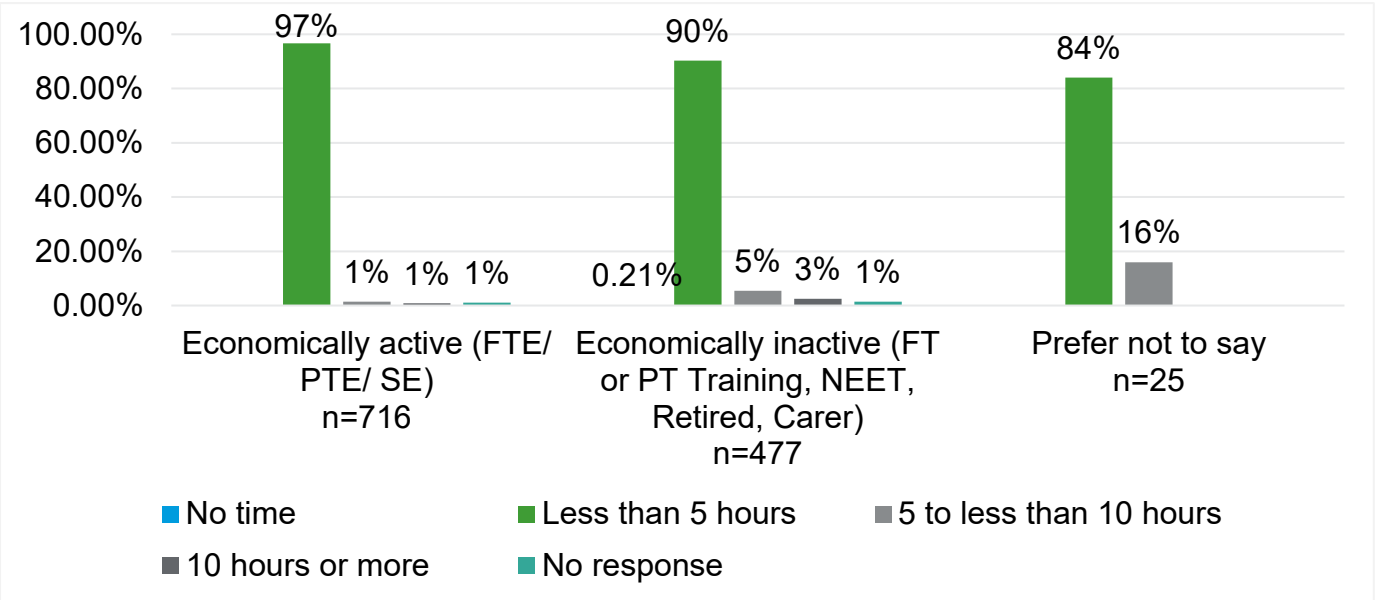


Figure 46: Additional time spent on planning food shop and checking / reading labels per week by people living with FHS broken down by economic status from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

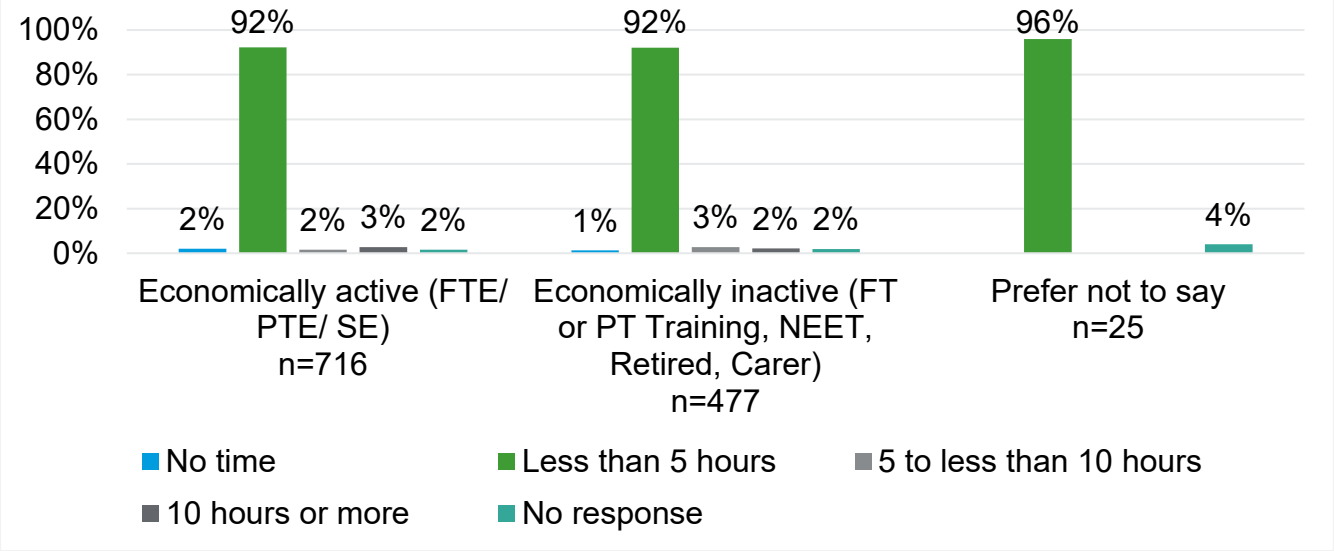


Figure 47: Time spent on shopping / planning FHS food purchases per week by people living with FHS broken down by household income from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

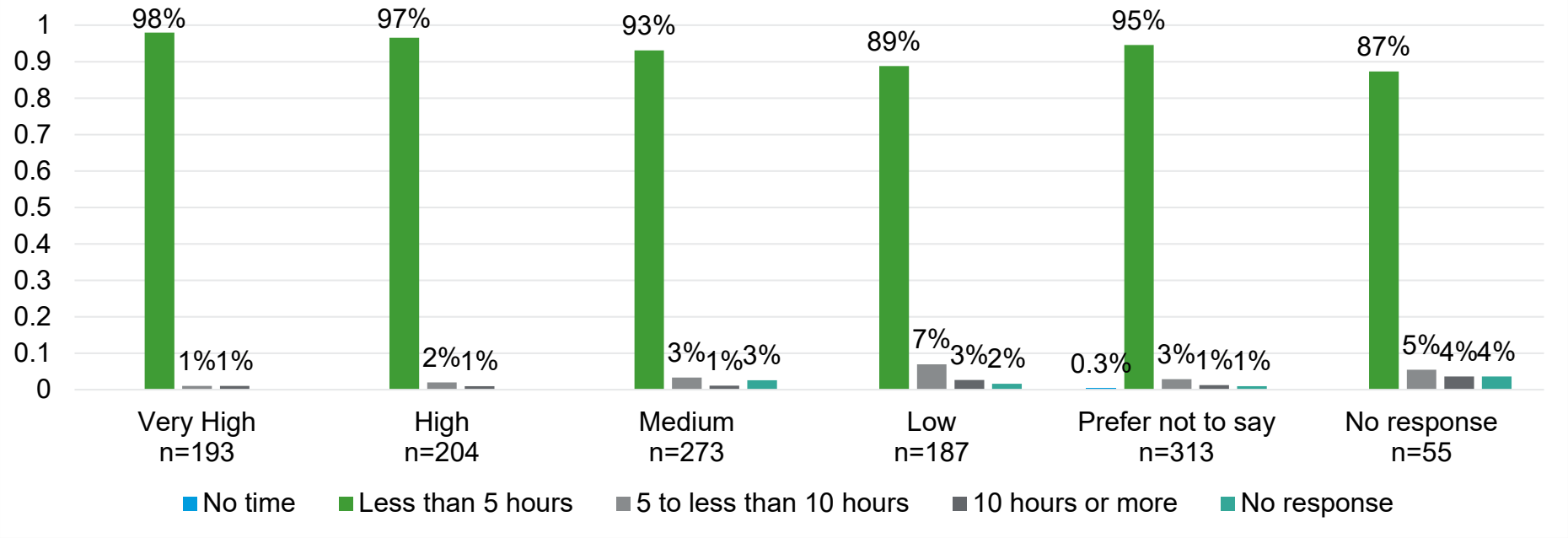
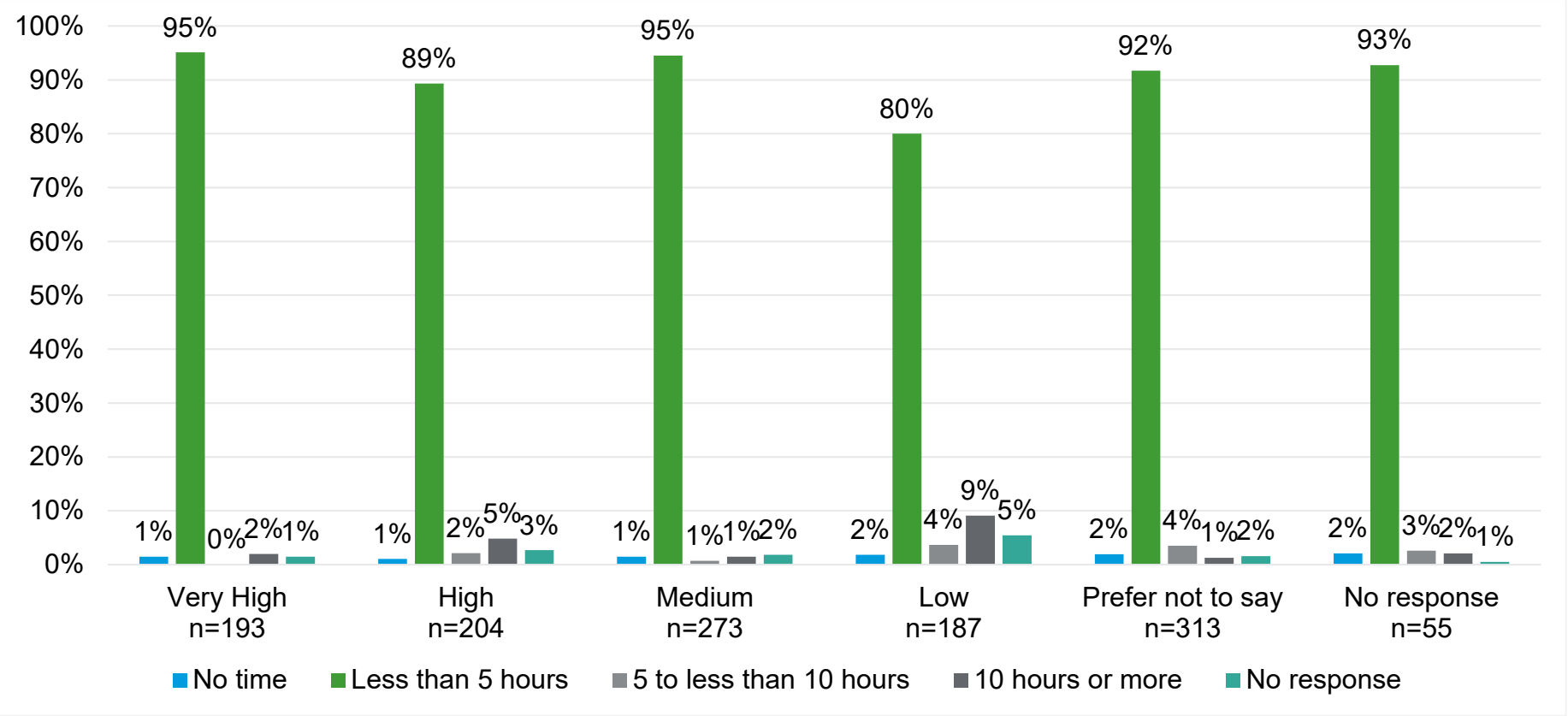


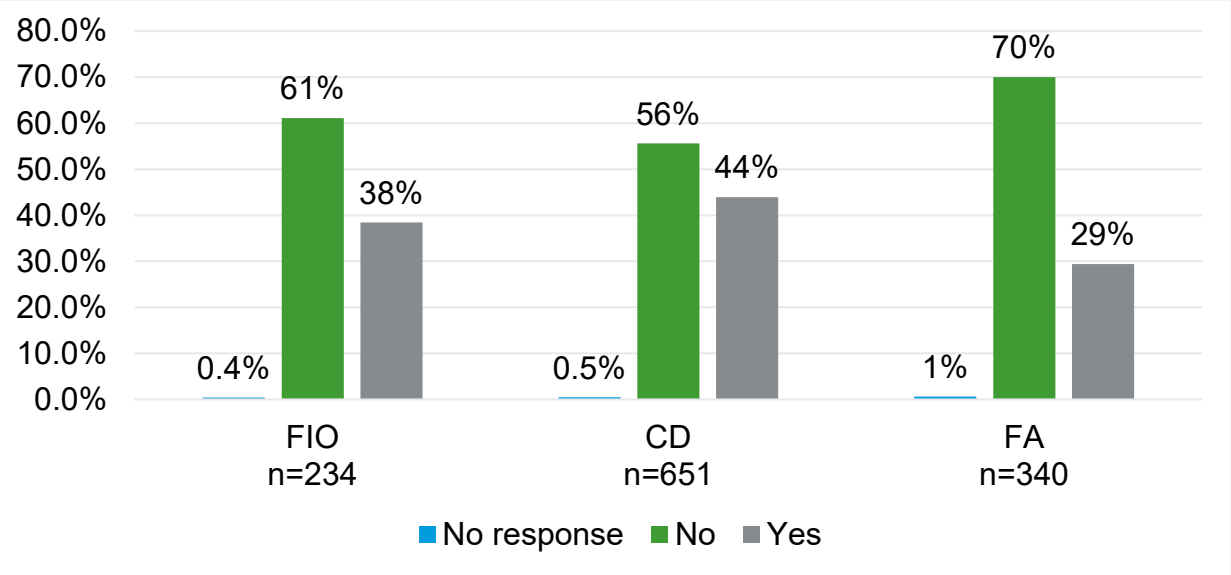
Figure 48: Additional time spent on planning food shop and checking / reading labels per week by people living with FHS broken down by household income from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Additional travel required to source FHS products

The graphs below indicate whether additional travels are required to source FHS products as well as additional time spent on travel cross tabulated by FHS cohort.

Figure 49: Whether any additional travel was required by people living with FHS to source FHS products broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



The graphs below indicate the time spent on additional travel stratified by those that responded “No” and “Yes” to whether additional travels are required to source FHS products. There are 6 “No responses” which have not been included below. There is a small number of respondents who responded “No” but indicated that they spent time on additional travel. Conversely, there is also a small number of respondents who responded “Yes” but did not indicate any hours of additional travel.

Figure 50: Additional travel time required (hours per week) to source FHS products for people living with FHS who responded "No" to the previous question, broken down by FHS group, from FHS online survey (based on 61% of the sample used in the analysis, n=743) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

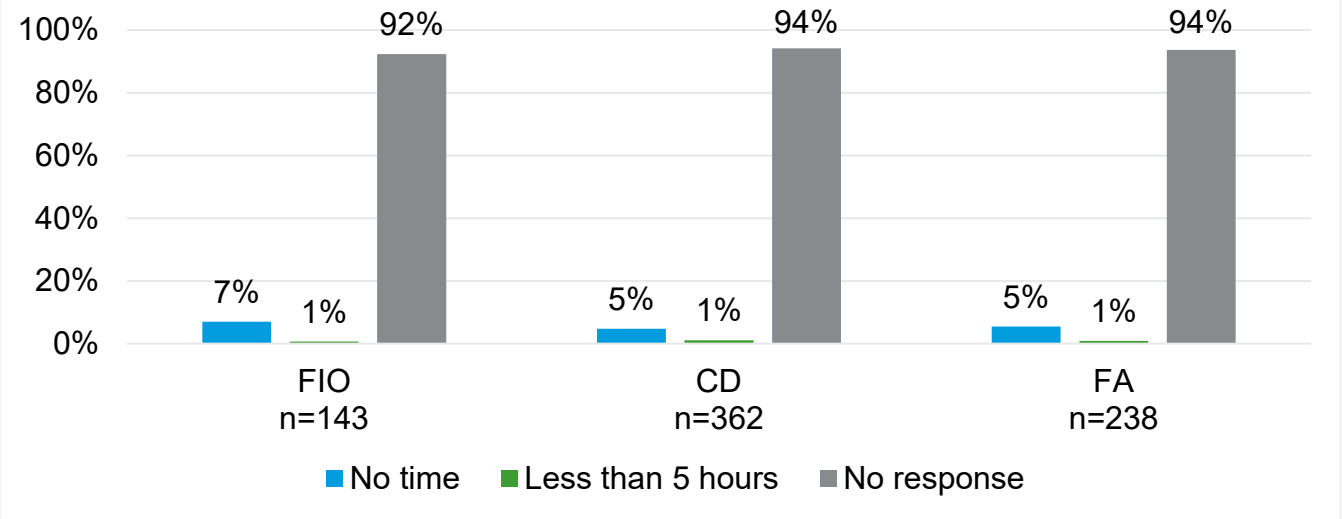
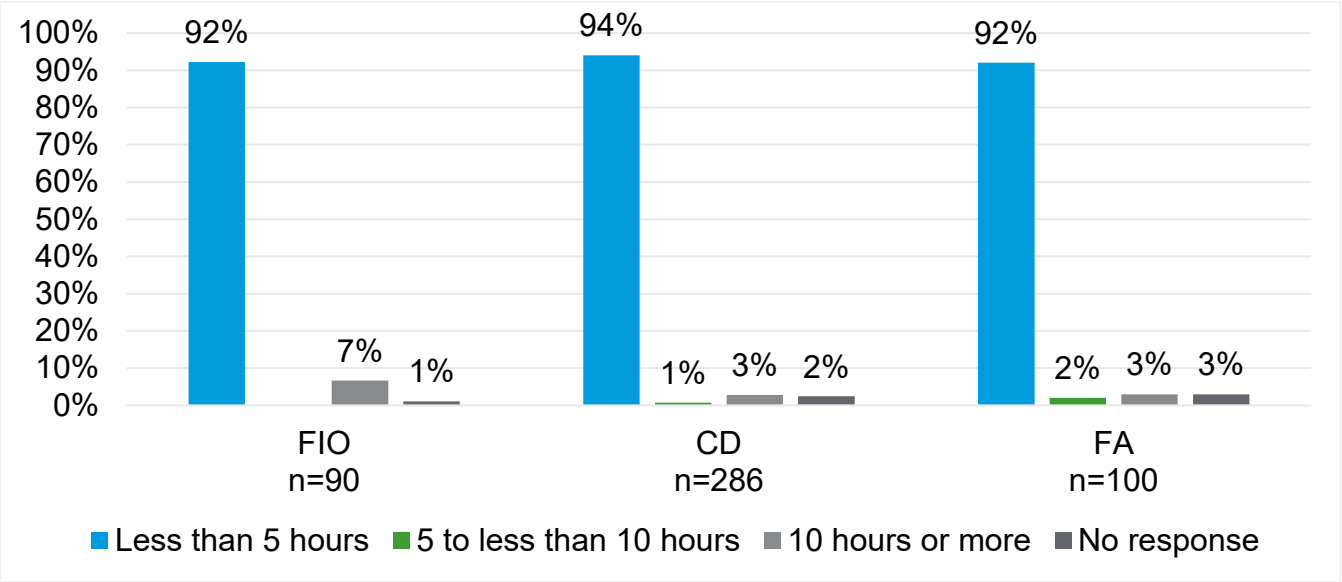
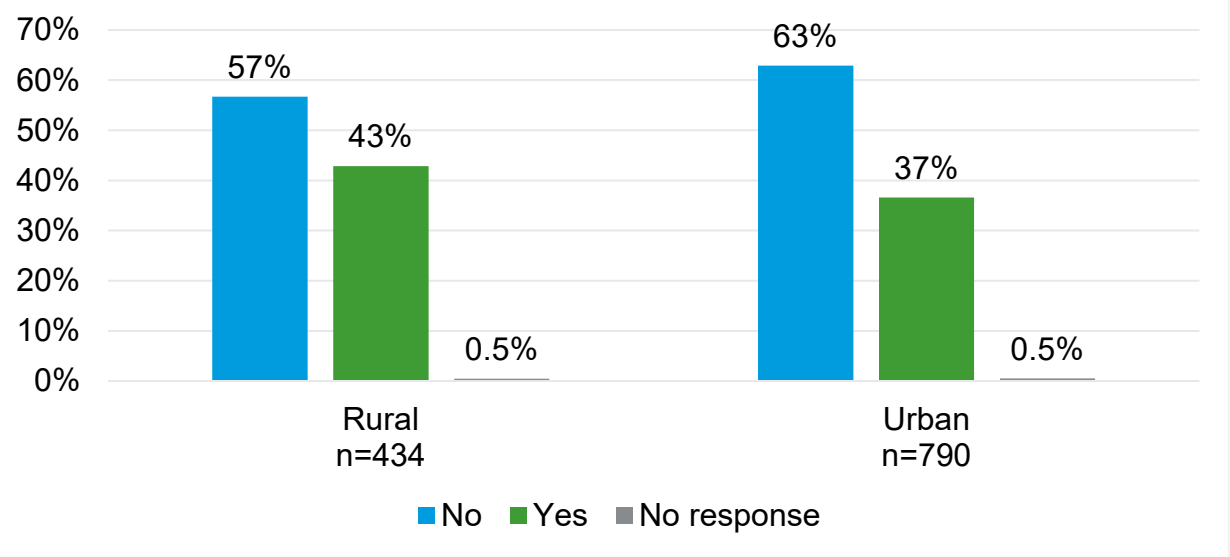


Figure 51: Additional travel time required (hours per week) to source FHS products for people living with FHS who responded "Yes" to the previous question, broken down by FHS group, from FHS online survey (based on 39% of the sample used in the analysis, n=476) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



The graphs below indicate whether additional travels are required to source FHS products as well as additional time spent on travel cross tabulated by geography.

Figure 52: Whether any additional travel was required by people living with FHS to source FHS products broken down by geography from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



The graphs below indicate the time spent on additional travel stratified by those that responded “No” and “Yes” to whether additional travels are required to source FHS products. There are 6 “No responses” which have not been included below. There is a small number of respondents who responded “No” but indicated that they spent time on additional travel. Conversely, there is also a small number of respondents who responded “Yes” but responded they spent zero hours on additional travel.

Figure 53: Additional travel time required (hours per week) to source FHS products for people living with FHS who responded "No" to the previous question, broken down by geography, from FHS online survey (based on 61% of the sample used in the analysis, n=743) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

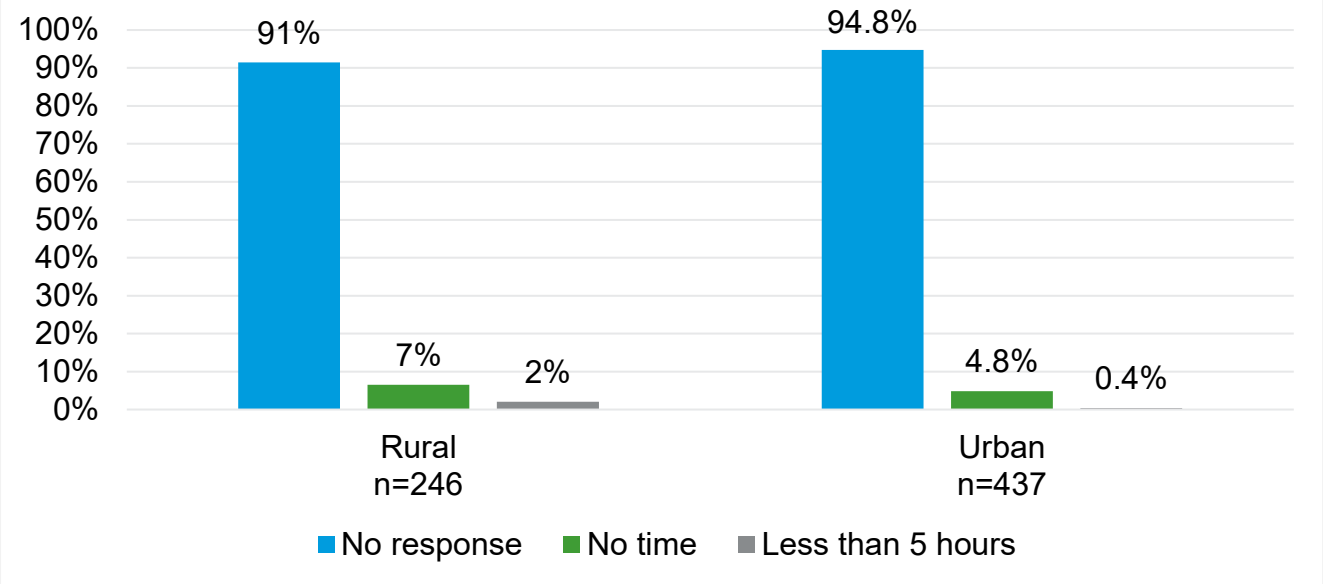
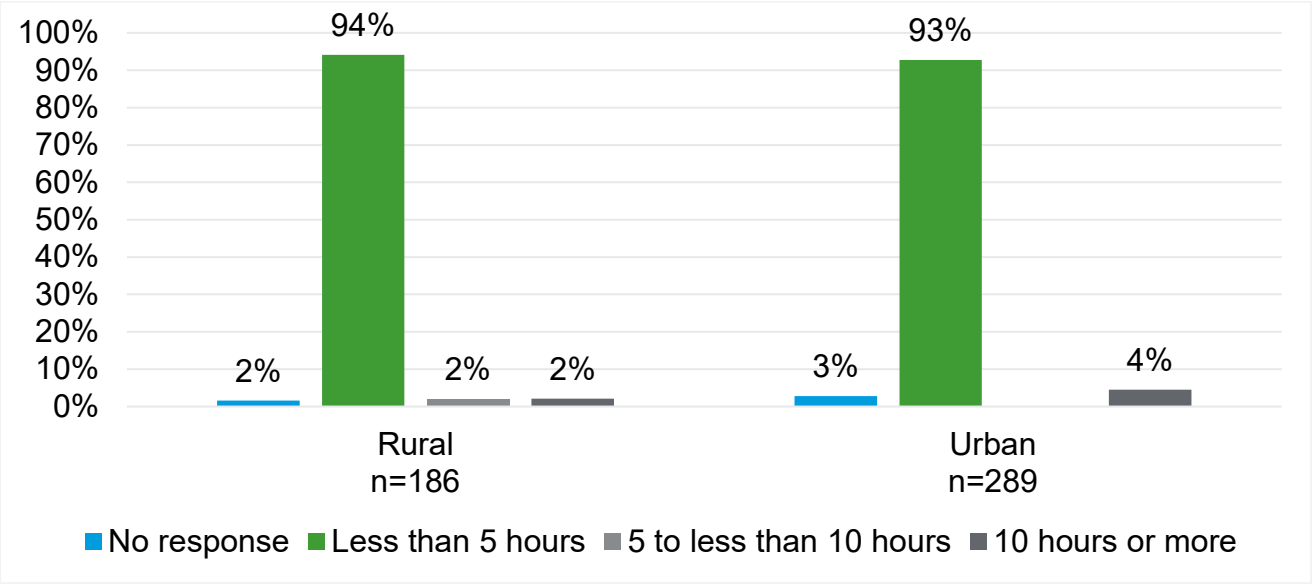


Figure 54: Additional travel time required (hours per week) to source FHS products for people living with FHS who responded "Yes" to the previous question, broken down by geography, from FHS online survey (based on 39% of the sample used in the analysis, n=475 as 1 respondent did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Time spent on planning eating out / takeaways due to FHS

The below graphs indicate how much additional time per month people living with FHS spend on planning eating out / takeaways, cross tabulated by FHS cohort and geography variables.

Figure 55: Extra time spent by people living with FHS per month on planning and preparing for eating out and getting takeaways due to FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

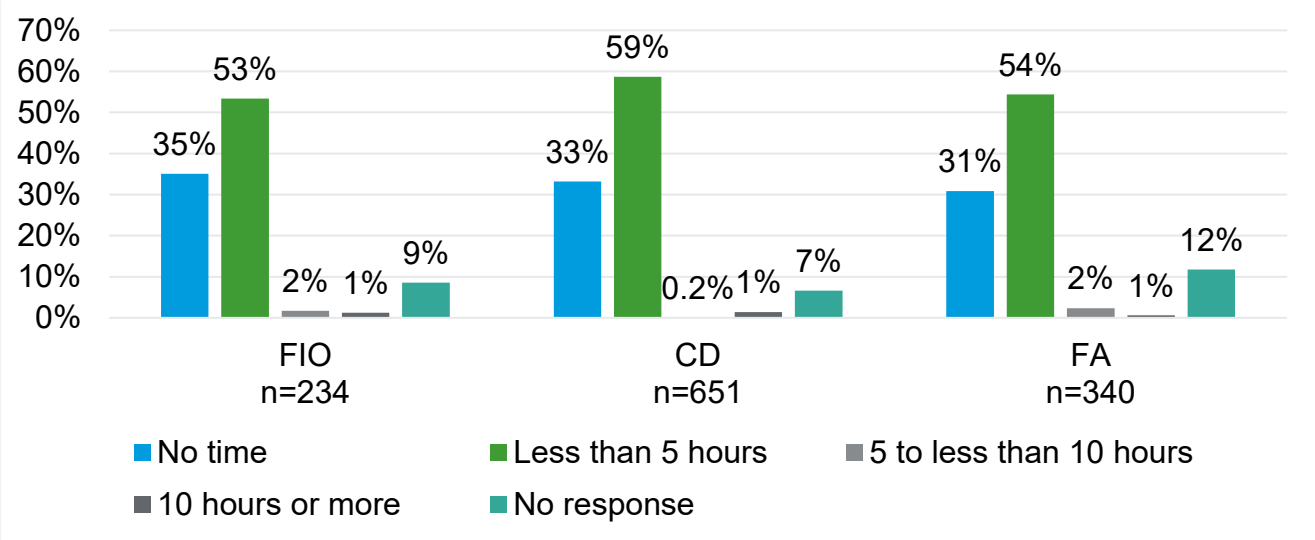
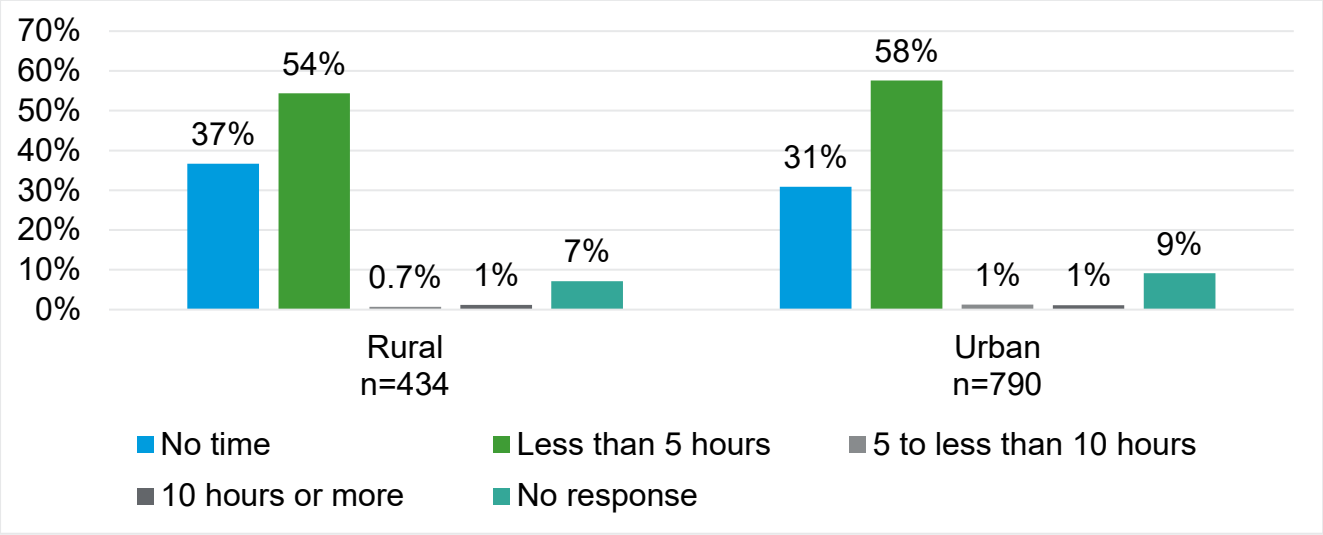


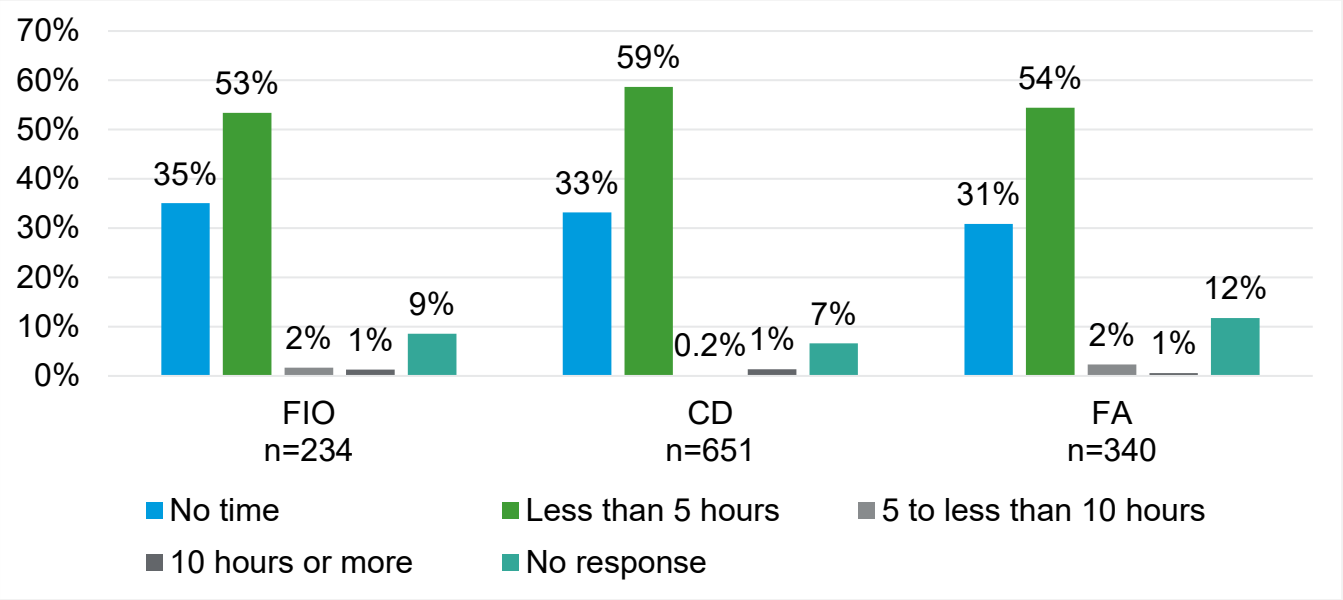
Figure 56: Extra time spent by people living with FHS per month on planning and preparing for eating out and getting takeaways due to FHS broken down geography from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Time spent on planning visiting / hosting friends and family due to FHS

The figure below shows how much time per month people living with FHS spend on planning visiting / hosting friends and family cross tabulated by FHS cohort.

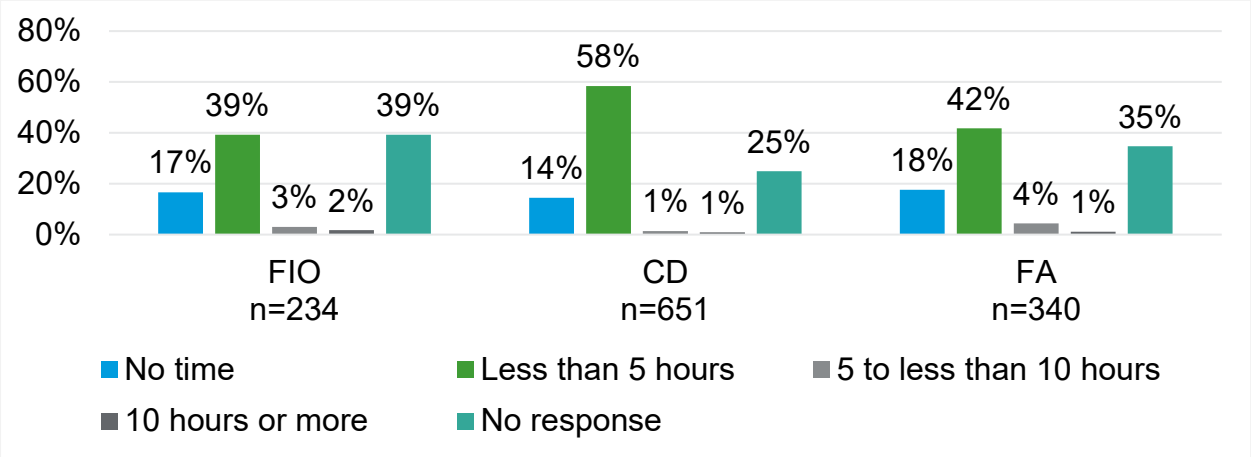
Figure 57: Extra time spent by people living with FHS per month on planning visiting / hosting friends and family due to FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Time spent on appointments due to FHS

The graphs in this section show how long, on average, the appointments (including travel) last. These questions are cross tabulated by FHS cohort.

Figure 58: Time spent by people living with FHS on an average appointment due to FHS including travel time, broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Time spent on researching / education / training for FHS for self / family + others

The graphs below indicate how much time people living with FHS spend on research, training or education related to FHS in hours per month as well as time spent on informing others. Each question is cross tabulated by FHS group.

Figure 59: Time spent by people living with FHS on research, training or education related to FHS per month, broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

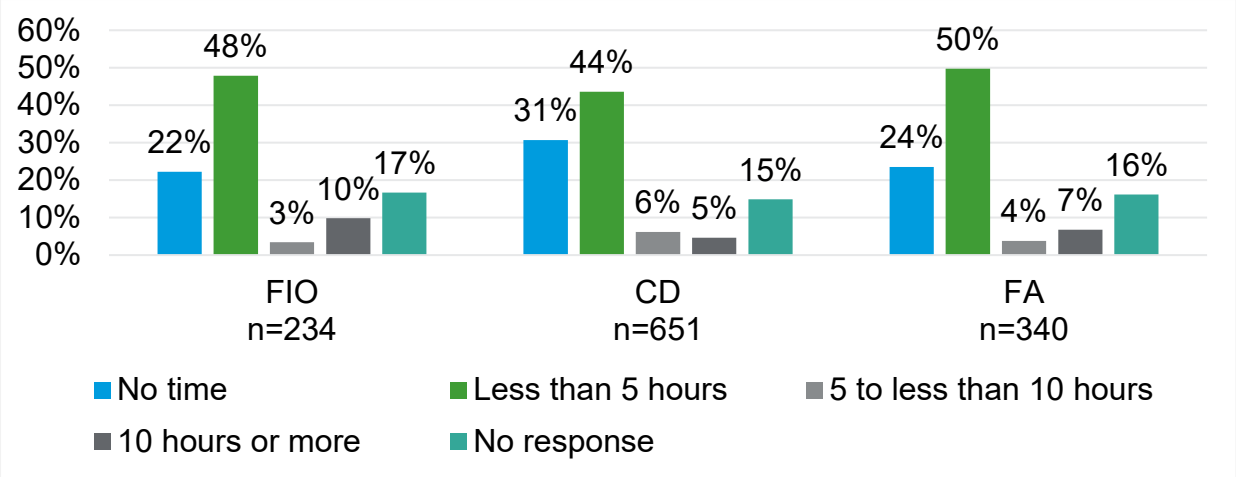
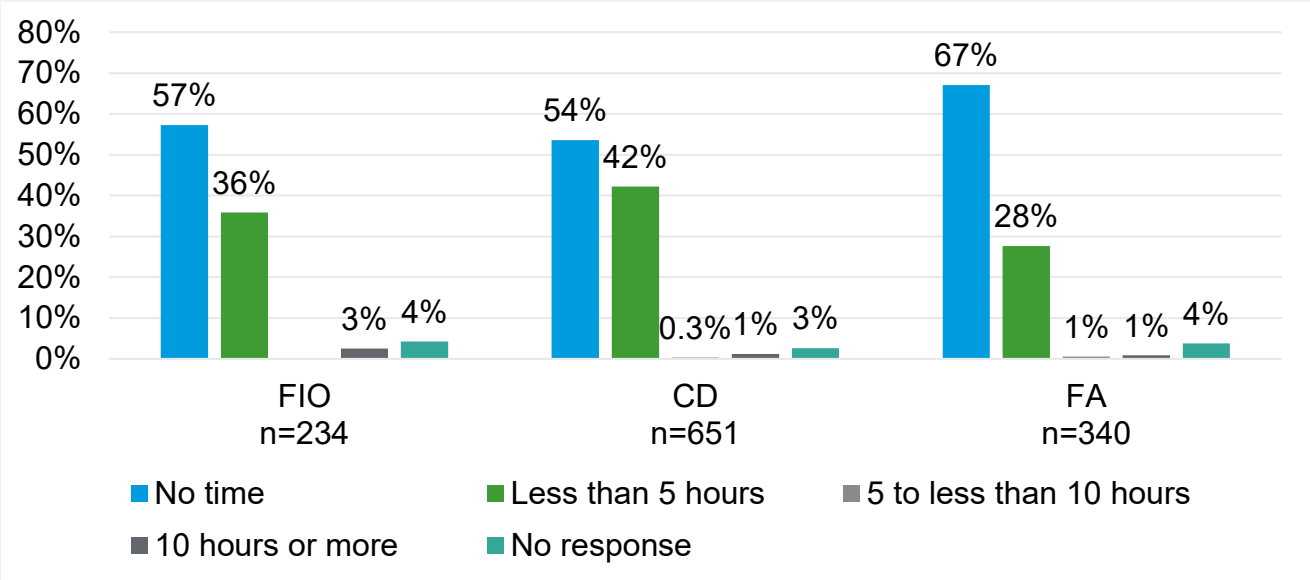


Figure 60: Time spent by people living with FHS on educating/informing other people about FHS per month, broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Changes to work due to FHS

This section provides graphs that indicate the frequency of certain changes to work experiences by people living with FHS. Three quarters (86%, n = 1,054) of all respondents said they did not have any changes to working due to FHS or did not provide any responses. The rest of the respondents indicated the following changes to work (the question allowed respondents to choose multiple options):

- Switched to flexible working (n=40)
- Changed jobs (n=31)
- Now work from home (n=67)
- Reduction in working hours (n=37)
- Stopped working completely (n=72)

Changes to working are cross tabulated by FHS cohort, geography, education status, economic status, and household income variables.

Figure 61: Changes to working due to FHS broken down by FHS group from FHS online survey (based on 14% of the sample used in the analysis, n=171) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

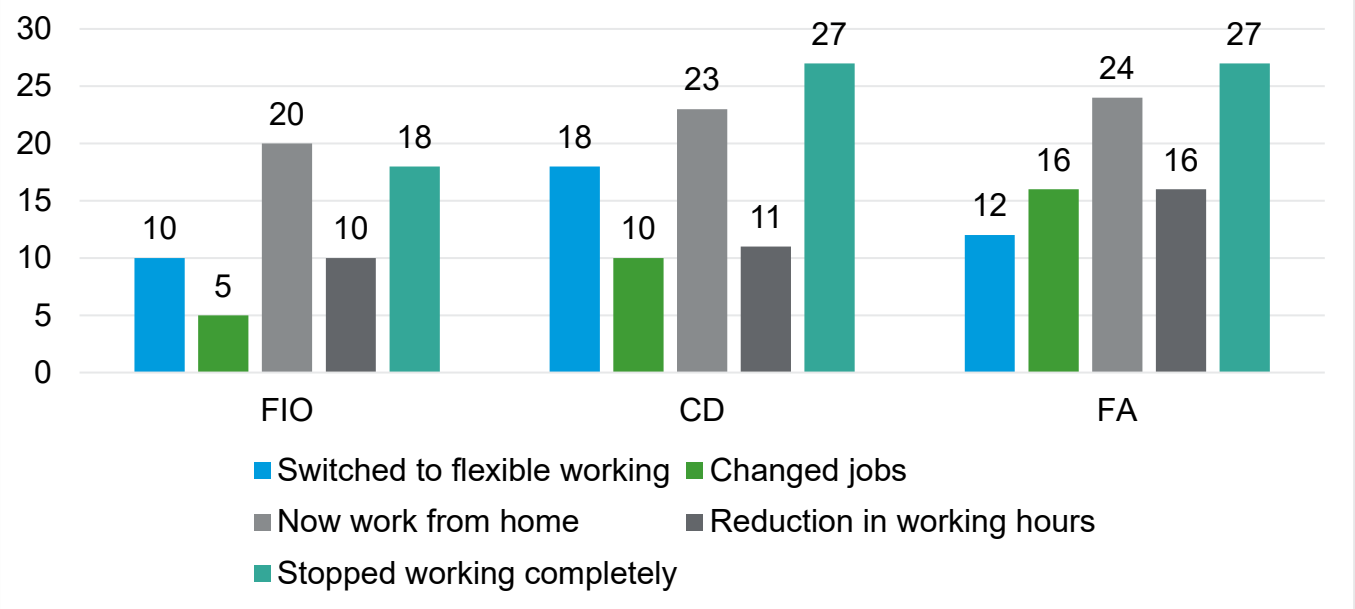


Figure 62: Changes to working due to FHS broken down by geography from FHS online survey (based on 14% of the sample used in the analysis, n=171) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

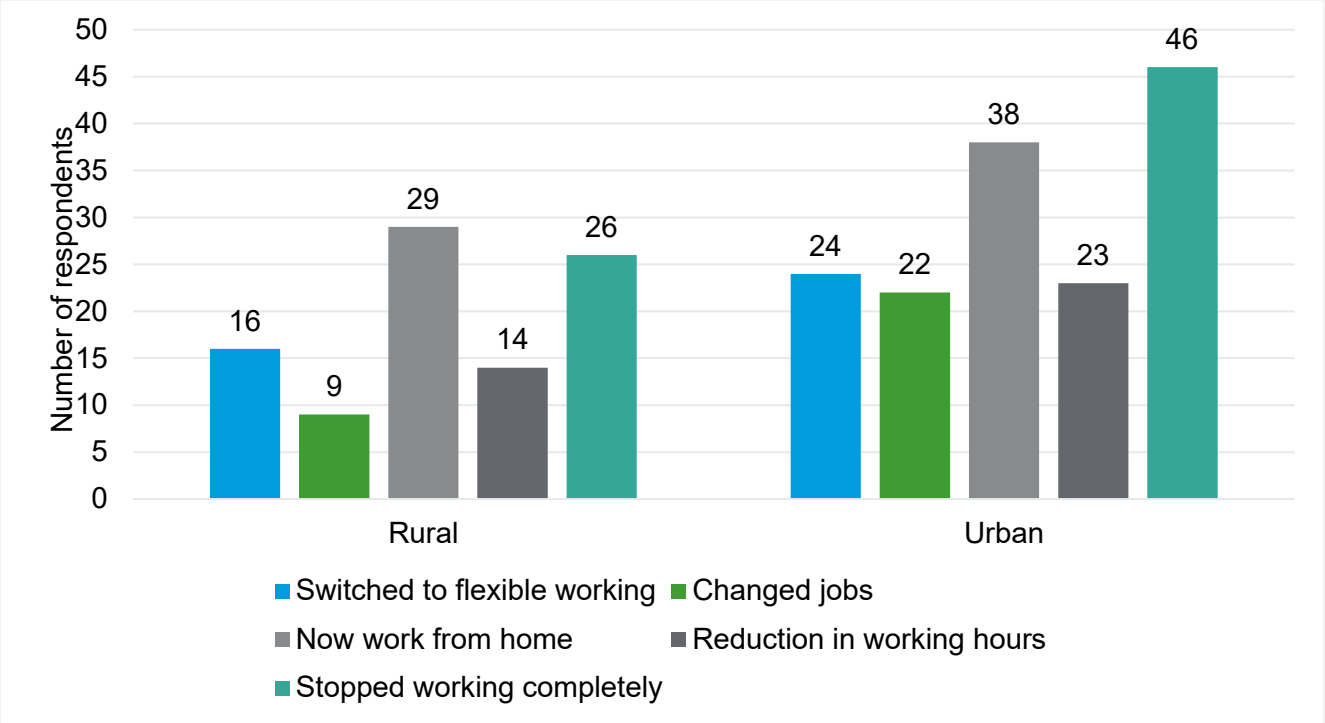


Figure 63: Changes to working due to FHS broken down by education status from FHS online survey (based on 14% of the sample used in the analysis, n=171) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

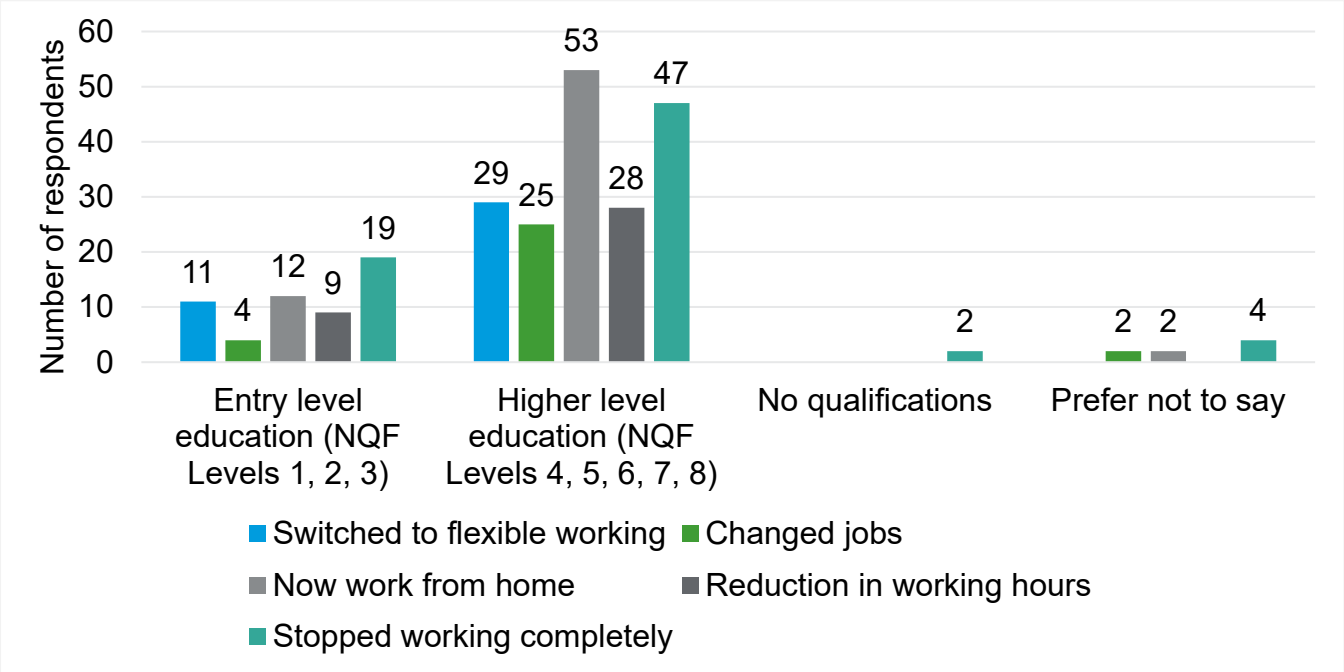


Figure 64: Changes to working due to FHS broken down by economic status from FHS online survey (based on 14% of the sample used in the analysis, n=171) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

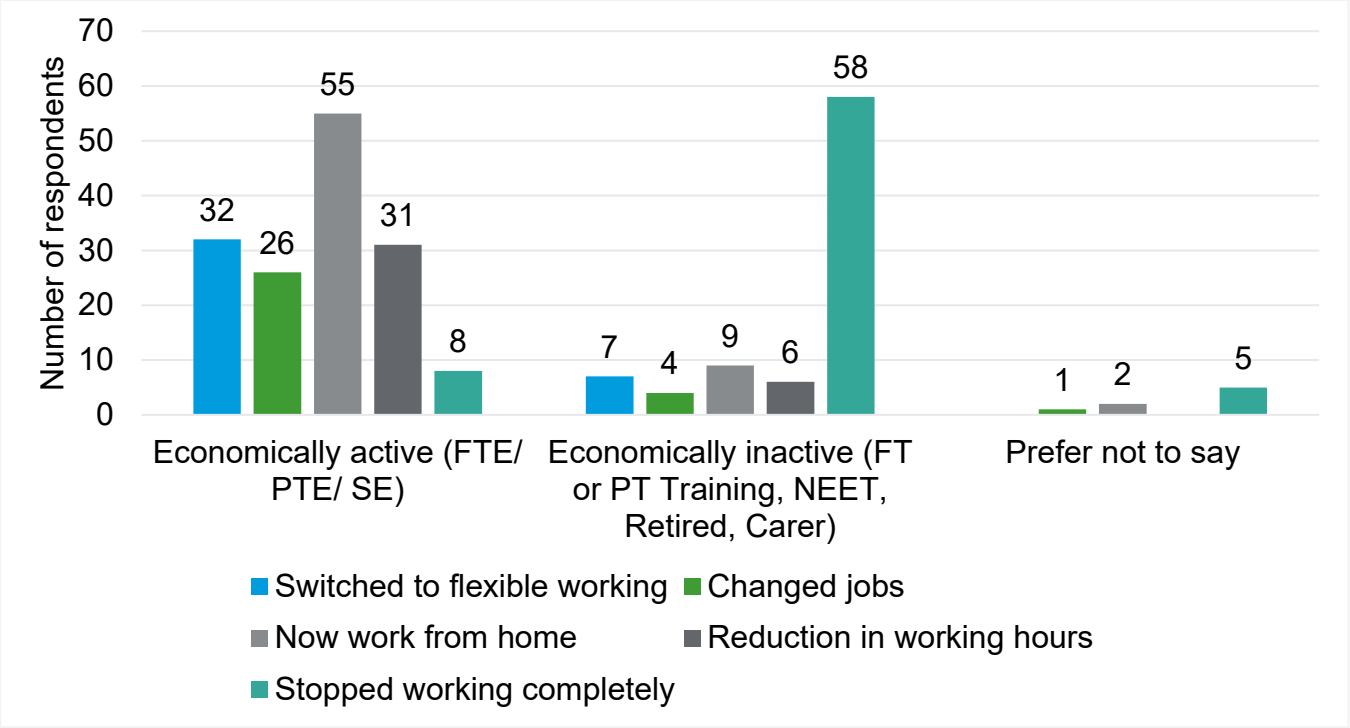
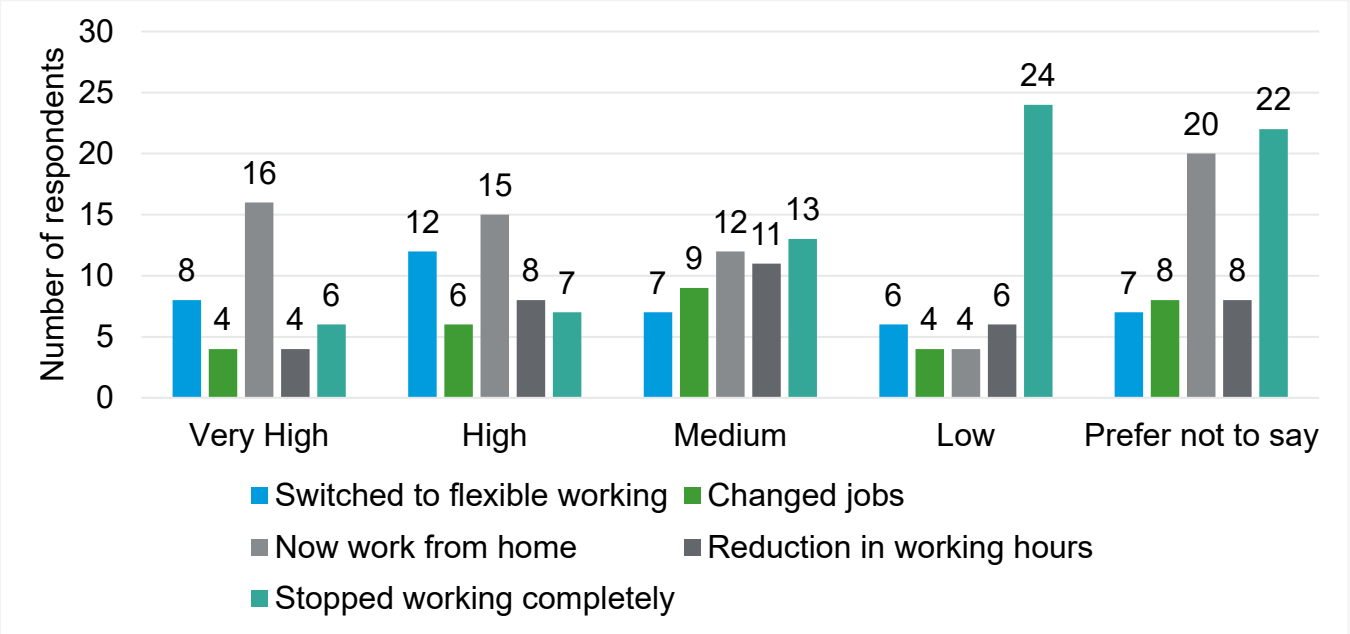


Figure 65: Changes to working due to FHS broken down by household income from FHS online survey (based on 14% of the sample used in the analysis, n=171) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Workdays lost due to FHS

The graphs below indicate how many workdays per year people living with FHS lost due to their condition, cross tabulated by FHS cohort, geography, education status, economic status, and household income variables.

Figure 66: Workdays lost per annum due to FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

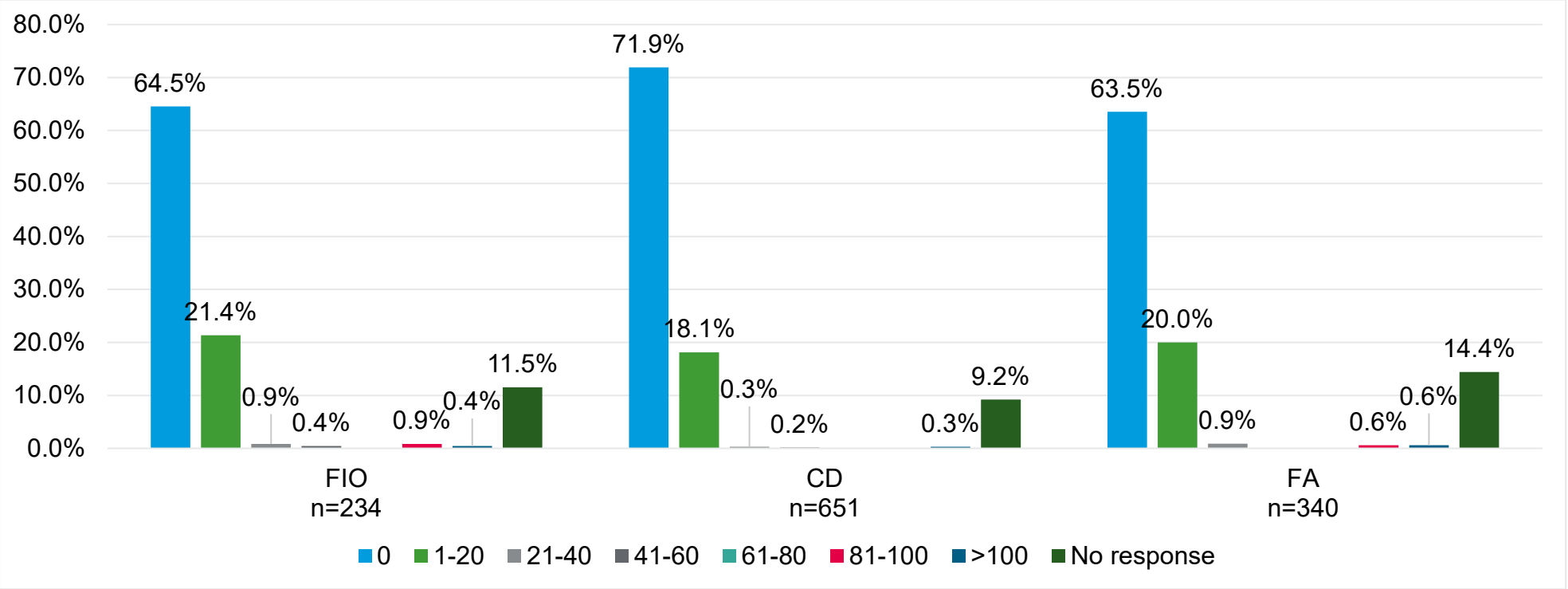


Figure 67: Workdays lost per annum due to FHS broken down by geography from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as 1 observation did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

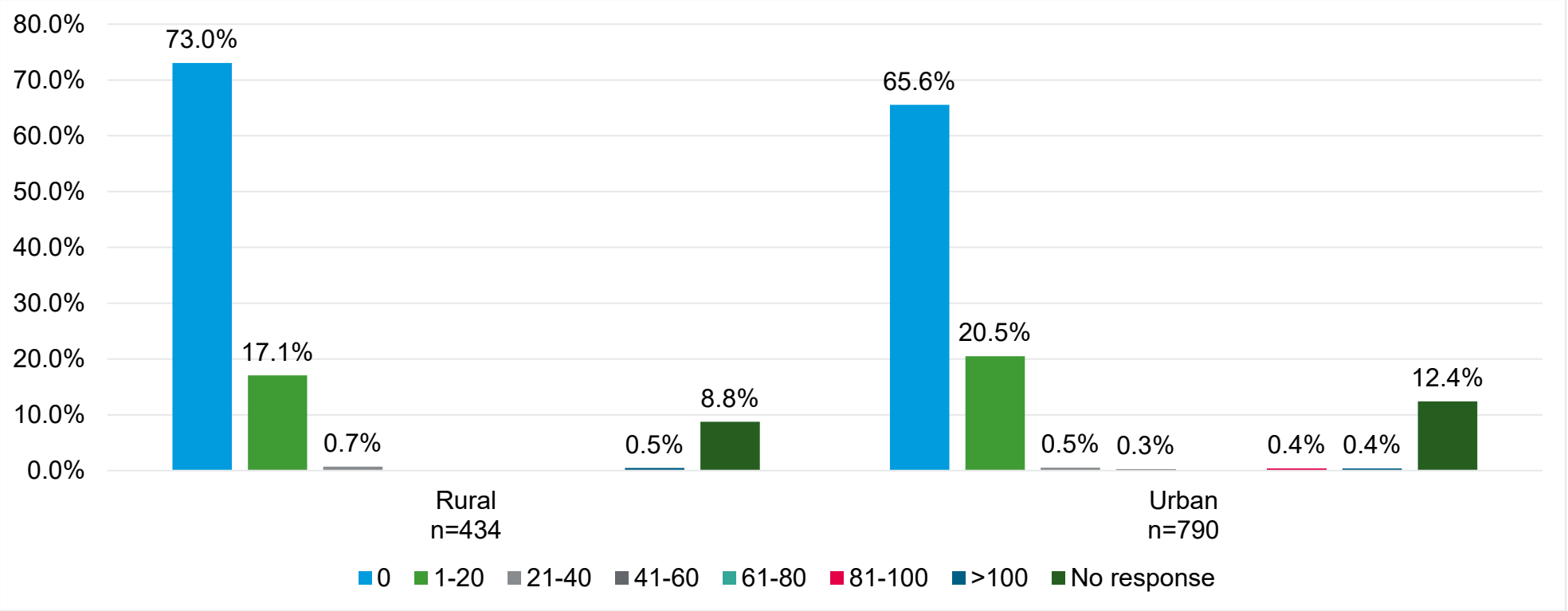


Figure 68: Workdays lost per annum due to FHS broken down by education status from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as 1 observation was Not Available) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

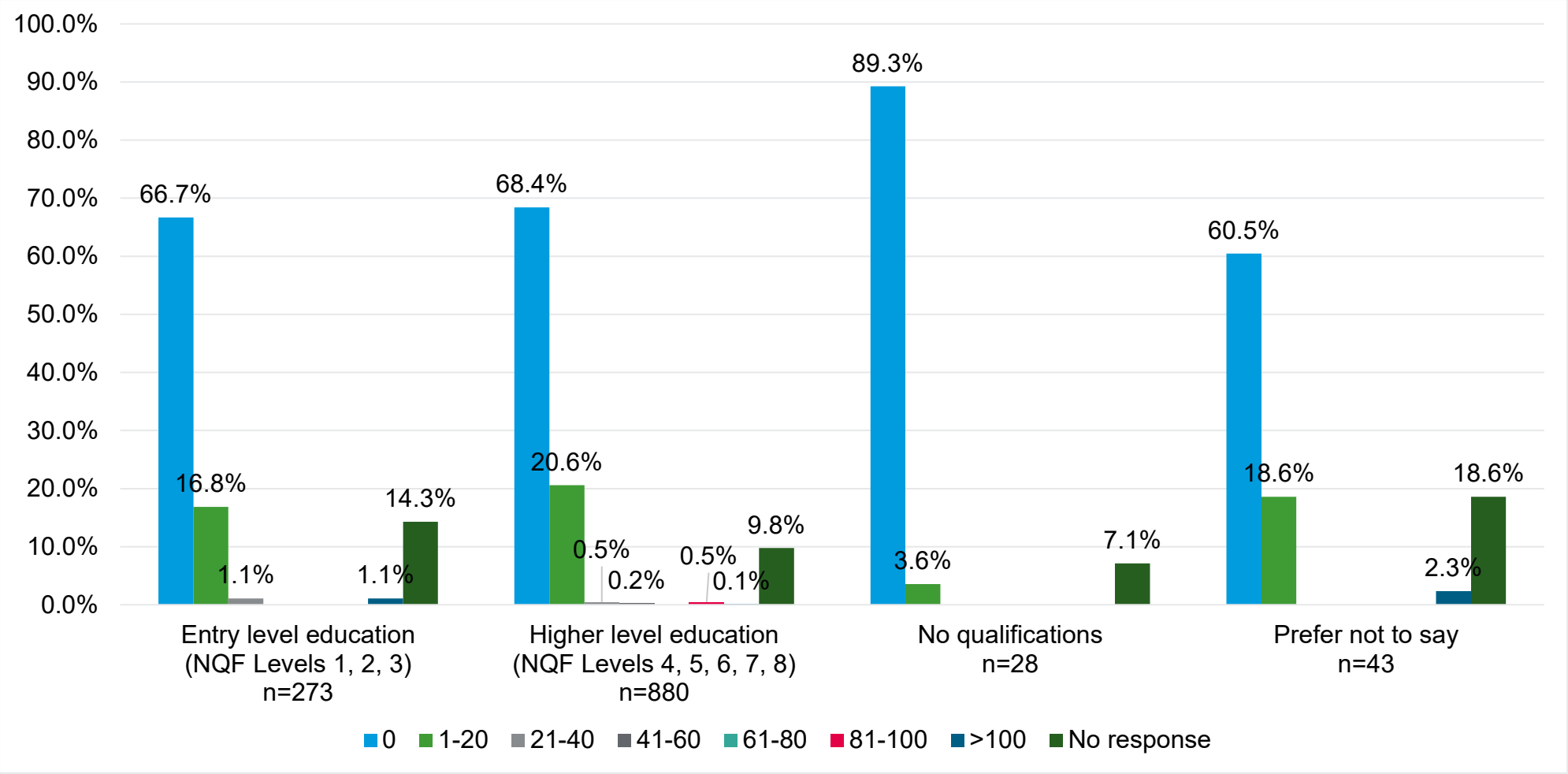


Figure 69: Workdays lost per annum due to FHS broken down by economic status from FHS online survey (based on 99% of the sample used in the analysis, n=1,218 as six observations were Not Available and one is of Other) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

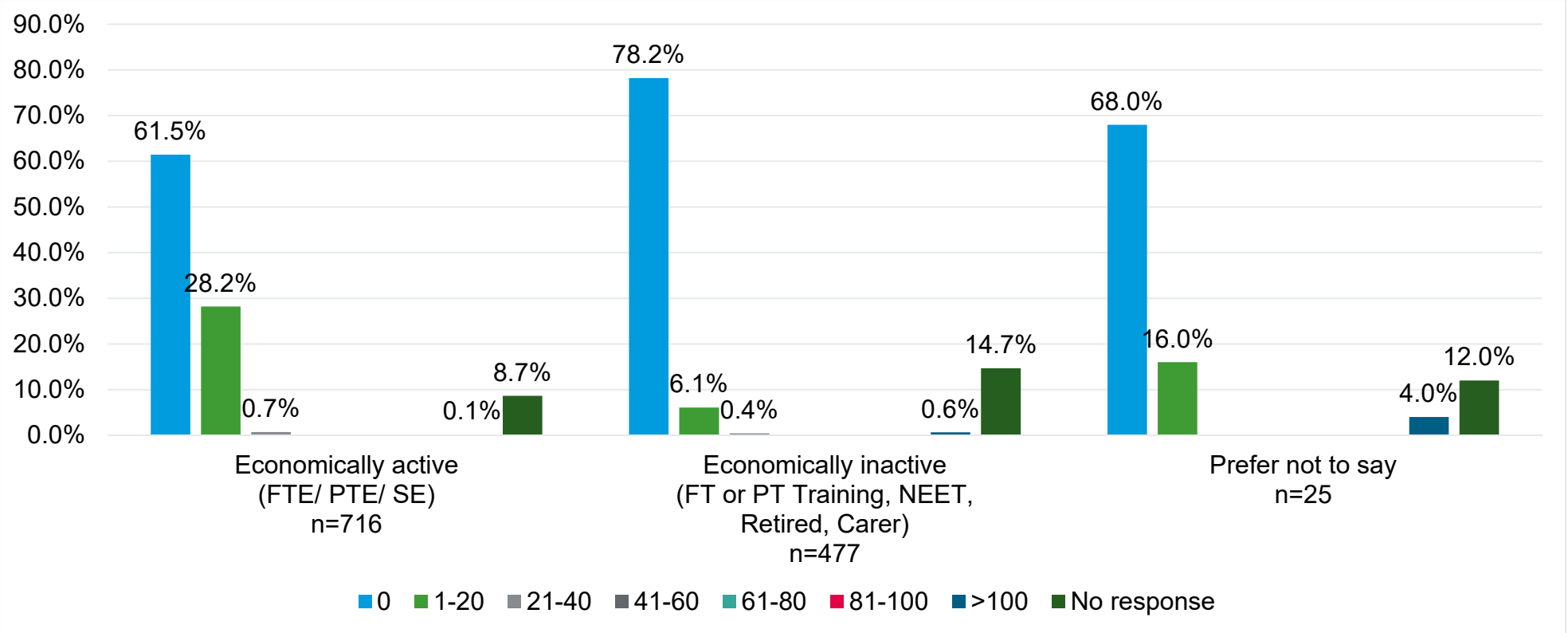
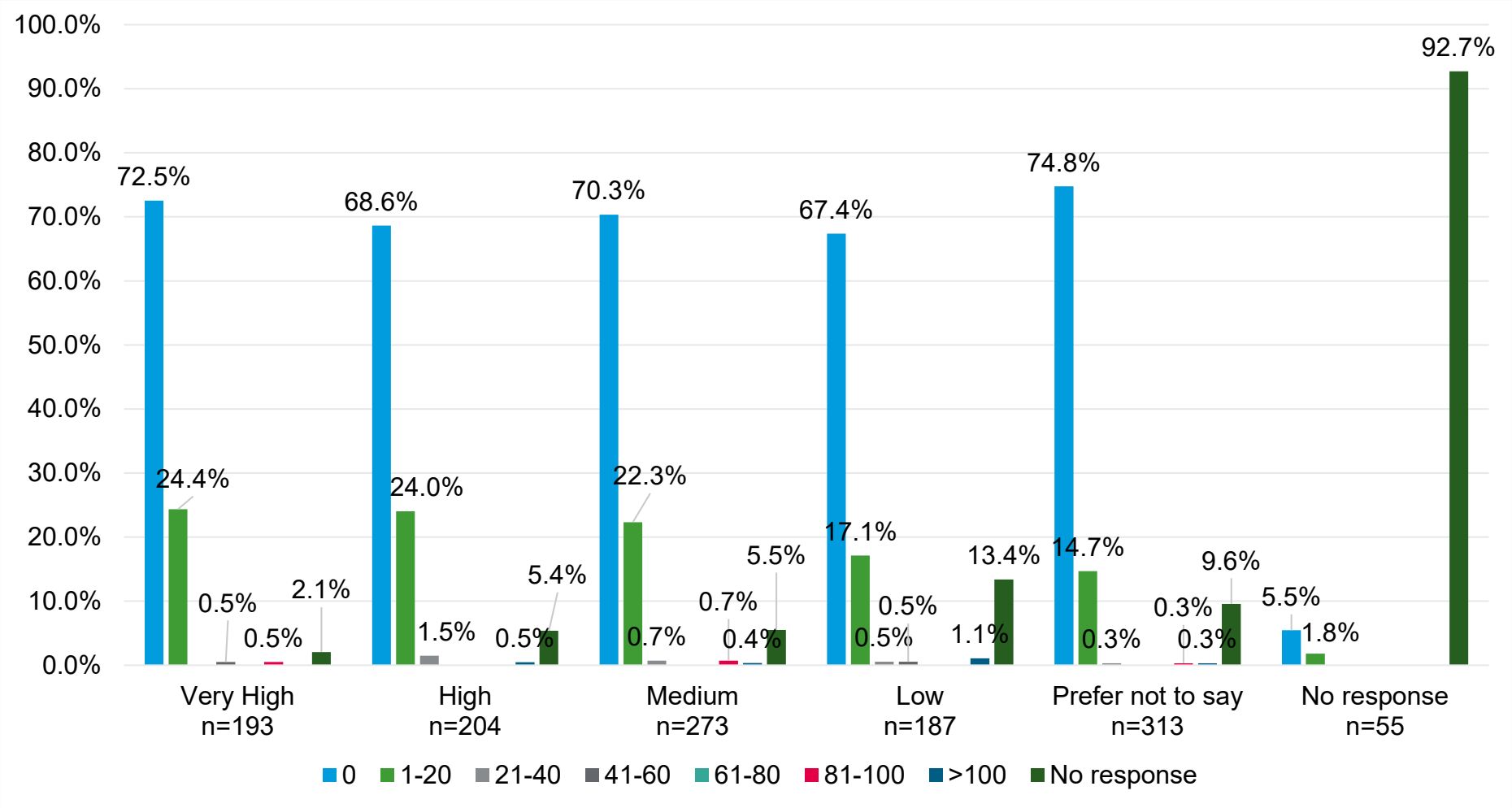


Figure 70: Workdays lost per annum due to FHS broken down by household income from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Unpaid days lost due to FHS

The graphs below indicate how many unpaid days per year people living with FHS lost due to their condition, cross tabulated by FHS cohort, geography, education status, economic status, and household income variables.

Figure 71: Unpaid days lost per annum due to FHS broken down by FHS group from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

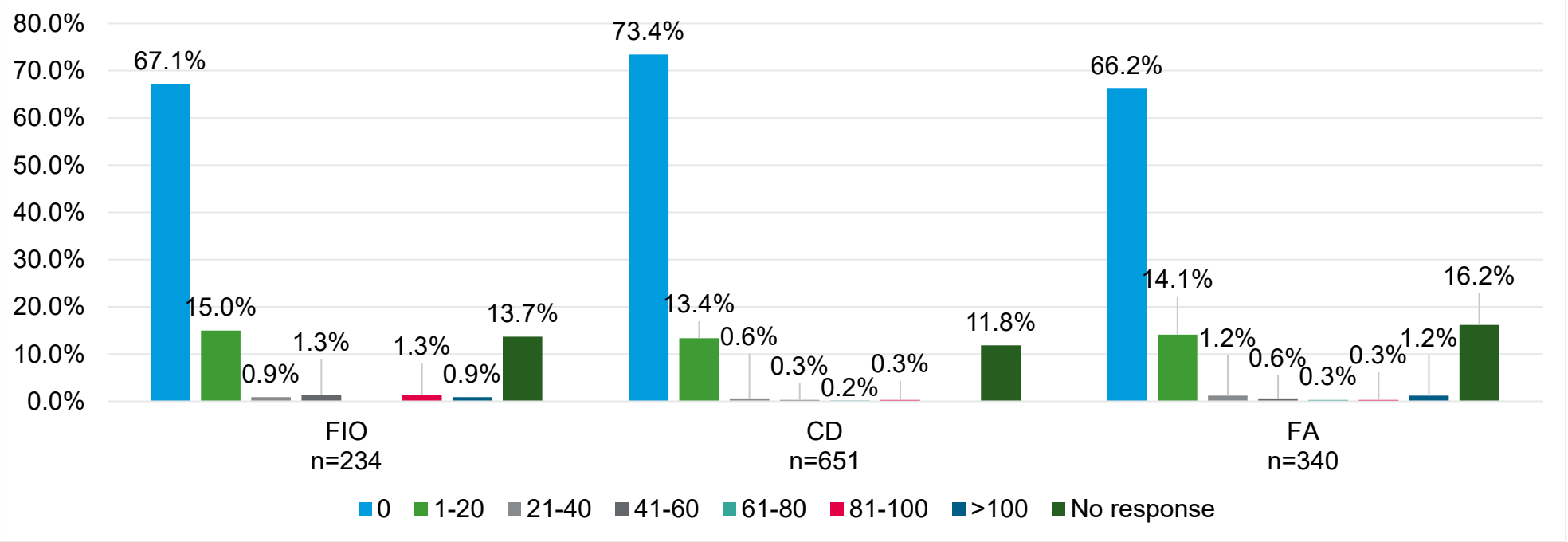


Figure 72: Unpaid days lost per annum due to FHS broken down by geography from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as one observation did not provide their geography) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

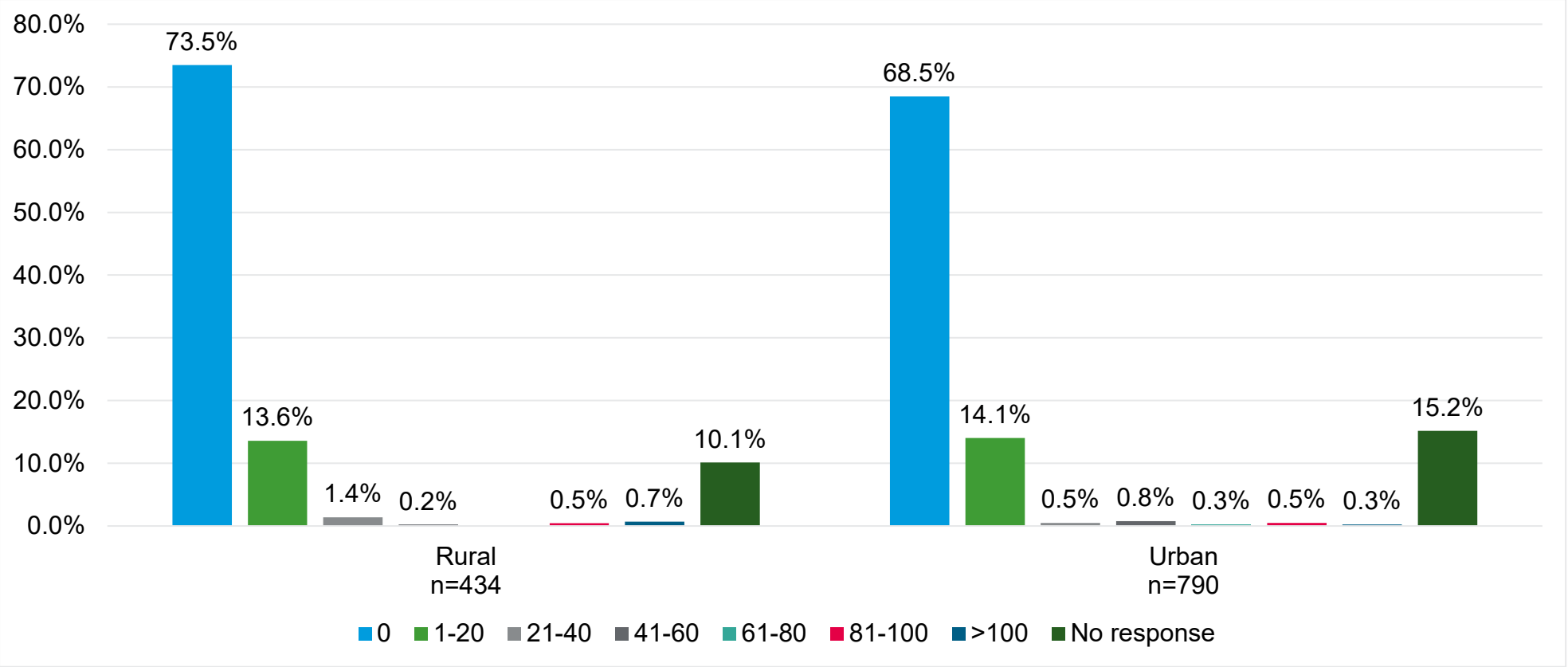


Figure 73: Unpaid days lost per annum due to FHS broken down by education status from FHS online survey (based on 99% of the sample used in the analysis, n=1,224 as 1 observation was Not Available) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

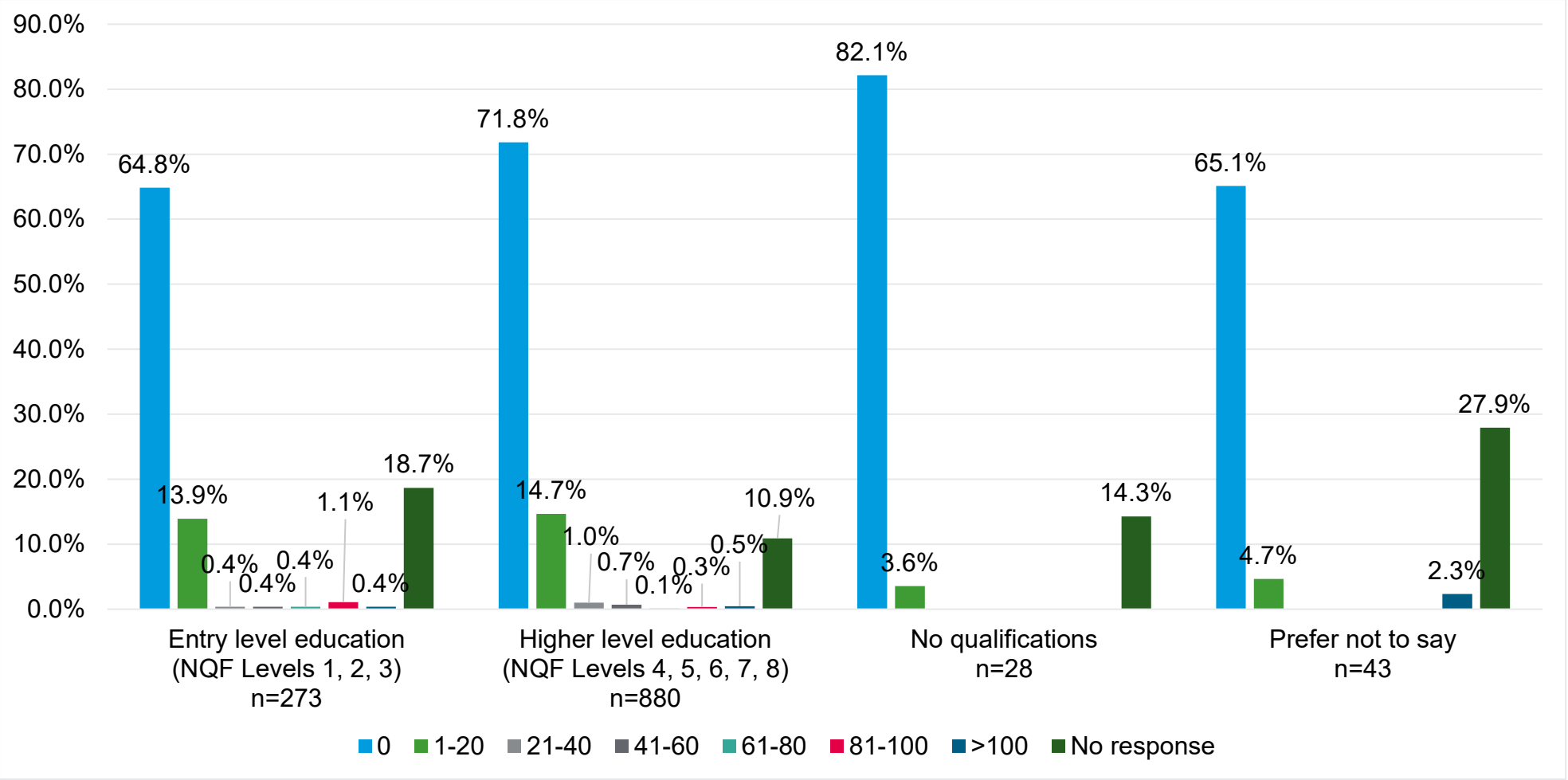


Figure 74: Unpaid days lost per annum due to FHS broken down by economic status from FHS online survey (based on 99% of the sample used in the analysis, n=1,218 as six observations were Not Available and one is of Other) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021

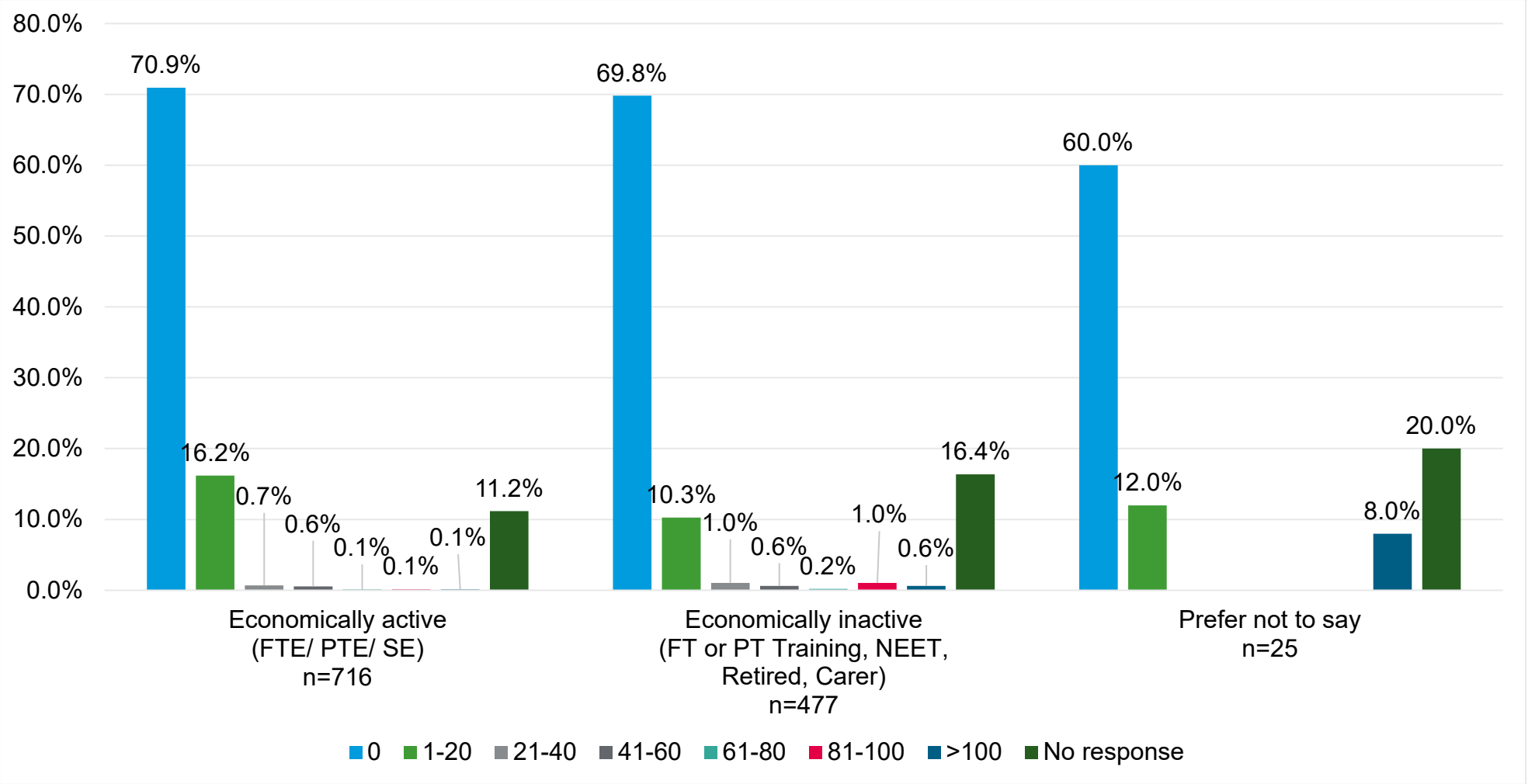
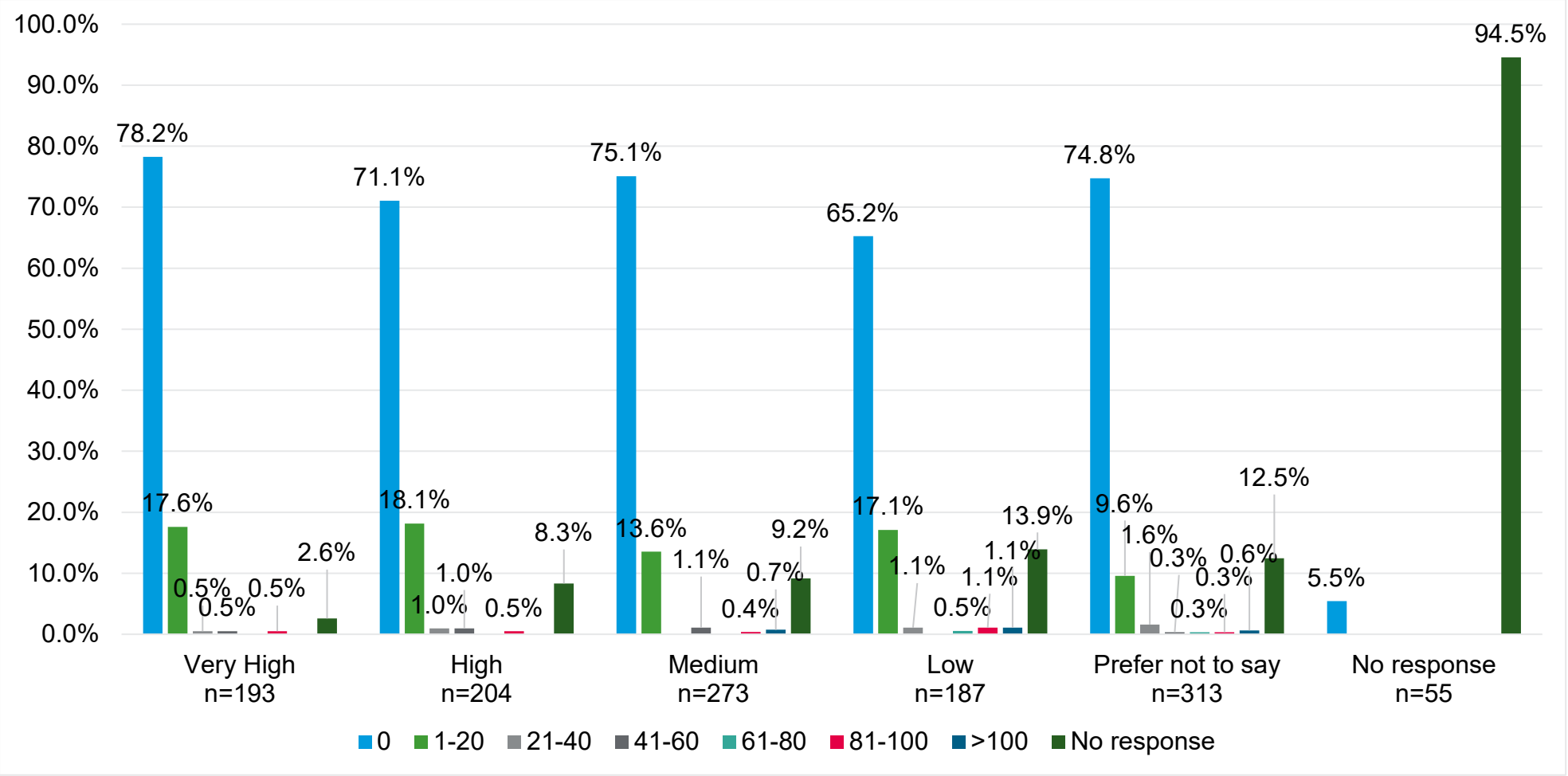


Figure 75: Unpaid days lost per annum due to FHS broken down by household income from FHS online survey (based on 100% of the sample used in the analysis, n=1,225) conducted in England, Northern Ireland, and Wales between November 2020 and January 2021



Appendix 10 – Propensity Score Matching Results

The tables below present the comparison of standardised mean differences before and after propensity score matching. Matching parameters used are “nearest neighbour” with caliper width of 0.2. All pre-matched and matched standardised mean differences presented below are for analysis with 5 imputations, except for FA with Weekly food diary costs. These are presented for analysis with 100 imputations.

Table 1: Propensity score matching results for weekly food diary costs for each FHS group and control variable

Variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Distance	3.0443	0.2081	2.0179	0.19	3.0187	0.2126
Household size – Large household	-0.2147	0.0338	-0.1031	0.0373	-0.0981	0.2388
Household size – Medium household	-0.072	0.1456	0.0557	0.1071	0.1627	-0.049
Household size – Single household	0.2245	0.0923	0.1745	-0.0424	0.0752	-0.1398

Variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Household size – Small household	-0.0079	-0.2138	-0.1323	-0.0715	-0.1372	0.0196
Household income - High	-0.1978	-0.0773	-0.1185	-0.0862	-0.3048	-0.0526
Household income - Low	0.3228	0.1215	0.0954	-0.052	0.2745	-0.0204
Household income - Medium	0.0249	0.02	0.1577	0.1254	0.2264	0.0606
Household income – Very High	-0.3162	-0.133	-0.2638	-0.0121	-0.4423	0
Region – England	-1.0216	-0.1369	-0.9784	-0.1366	-0.9642	-0.1777
Region – Norther Ireland	0.4515	0.023	0.4662	0.076	0.4766	0.1854
Region – Wales	0.6755	0.1244	0.6165	0.0763	0.5919	0.0209
Gender – Female	-0.7177	-0.1166	-0.5426	-0.0858	-0.6997	-0.2159

Variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Gender – Male	0.7347	0.1166	0.5668	0.0858	0.6997	0.2159
Gender – Other	-0.3441	0	-0.2602	0	NA	NA
Education - Entry level education (NQF Levels 1, 2, 3)	0.5204	0.0394	0.2875	0.0072	0.4346	0.0994
Education - Entry level education (NQF Levels 4, 5, 6, 7, 8)	-0.6051	-0.1363	-0.2938	-0.0143	-0.5034	-0.0786
Education – No qualifications	0.2173	0.2339	0.0226	0.0175	0.1772	-0.0476
Age 18-19	0.0443	0.2195	-0.4323	0	-0.3145	0.2216
Age 20-29	-0.1676	0.0386	-0.2924	0	-0.802	0.1948
Age 30-39	-0.0732	-0.1107	0.0321	0.0305	-0.0426	-0.1397
Age 40-49	-0.1164	0.0493	0.1193	0	-0.0579	-0.1993
Age 50-59	-0.0937	-0.118	0.0118	0.0521	0.1771	0.0238
Age 60-69	0.2794	0	0.1273	-0.0496	0.2981	-0.0681

Variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Age 70-79	0.1352	0.1194	-0.0655	-0.022	0.1257	0.1206
Age 80+	-0.1365	0.0926	-0.0377	-0.0341	0.106	0.4676
Ethnicity – BAME	-0.0835	-0.0963	0.1085	0.0527	-0.0154	0.0486
Ethnicity – Other	0.0443	0	-0.0238	-0.0807	0.0443	0.2216
Ethnicity – White	0.0722	0.0942	-0.1012	-0.0344	0.0058	-0.0951
Geography - Rural	-0.3061	-0.068	-0.2864	-0.0334	-0.3064	0.0229
Geography - Urban	0.3061	0.068	0.2864	0.0334	0.3064	-0.0229
Shop – Large supermarket chains	0.3102	-0.0644	-0.0762	-0.0473	-0.0727	-0.13
Shop - Online	-0.3161	0.151	0.0662	0	-0.0316	-0.0381
Shop – Other (specialist / independent)	-0.0721	-0.1137	0.035	0.0837	0.1761	0.2789

Table 2: Propensity score matching results for weekly grocery costs for each FHS group and control variable

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Distance	2.5073	0.1485	1.9834	0.1858	2.8102	0.2177
Household size – Large household	-0.13	0.0527	-0.1564	0.0337	-0.3818	0.1243
Household size – Medium household	-0.0662	-0.0505	0.0563	0.0545	-0.0088	-0.0223
Household size – Single household	0.2319	0.084	0.191	0.0058	0.2733	-0.0318
Household size – Small household	-0.0675	-0.0607	-0.116	-0.0679	-0.0035	-0.0268
Household income - High	-0.1337	-0.027	-0.1576	0.0517	-0.3308	-0.132
Household income - Low	0.3852	0.0316	0.1986	-0.0101	0.3803	0.1209
Household income - Medium	-0.0535	0.0626	0.1484	-0.0649	0.2549	0.0092

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Household income – Very High	-0.37	-0.12	-0.37	0.058	-0.6273	-0.0459
Region – England	-0.9949	-0.122	-0.9593	-0.1414	-0.9517	-0.1438
Region – Norther Ireland	0.4405	0.0597	0.4714	0.0172	0.4959	0.095
Region – Wales	0.6571	0.0755	0.5915	0.1344	0.5614	0.0667
Gender – Female	-0.6802	-0.0809	-0.5338	-0.0873	-0.5406	-0.0894
Gender – Male	0.6973	0.0809	0.5523	0.0873	0.5465	0.0894
Gender – Other	-0.254	0	-0.1767	0	-0.1276	0
Education - Entry level education (NQF Levels 1, 2, 3)	0.4606	-0.0102	0.2799	-0.0049	0.5024	0

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Education - Entry level education (NQF Levels 4, 5, 6, 7, 8)	-0.5179	-0.0101	-0.2918	-0.0097	-0.579	-0.1074
Education – No qualifications	0.1513	0.0494	0.0359	0.0352	0.1996	0.2618
Age 18-19	-0.0523	0	-0.3394	0	-0.8892	-0.1009
Age 20-29	-0.1544	0.0803	-0.3001	0	-0.855	-0.1064
Age 30-39	-0.0652	0	0.058	0.0621	-0.0946	0
Age 40-49	-0.1758	-0.0642	0.1455	0.0554	0.0444	0
Age 50-59	-0.0263	-0.0614	0.0516	-0.0118	0.1586	0.0109
Age 60-69	0.2471	0.0117	0.0948	-0.0561	0.321	0.0103
Age 70-79	0.1727	0.0776	-0.1332	-0.0447	0.1974	0.0412
Age 80+	-0.1794	0	-0.0559	0	0.0216	0.0852
Ethnicity – BAME	-0.1072	0.0501	0.1265	0.06	-0.1071	0.0439
Ethnicity – Other	-0.1489	0.1142	0.0094	0.0547	0.0443	0.3028
Ethnicity – White	0.1369	-0.0735	-0.1258	-0.0705	0.0954	-0.1076

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Geography - Rural	-0.1438	-0.0118	-0.329	0	-0.2275	0.0521
Geography - Urban	0.1438	0.0118	0.329	0	0.2275	-0.0521
Shop – Large supermarket chains	0.2166	0	-0.0903	-0.1043	-0.0425	-0.1036
Shop – Online	-0.2381	0.0196	0.073	0.0753	-0.0097	0.0347
Shop – Other (specialist / independent)	-0.0241	-0.0296	0.0495	0.0709	0.0897	0.1307

Table 3: Propensity score matching results for weekly eating out / takeaway costs for each FHS group and control variable

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Distance	2.7965	0.2026	2.1483	0.2039	3.058	0.2451
Household size – Large household	-0.13	-0.0567	-0.1596	0	-0.3818	-0.0821
Household size –	-0.0662	0	0.0545	0.0063	-0.0088	0.059

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Medium household						
Household size – Single household	0.2319	0.1033	0.1926	0.0541	0.2733	0.0224
Household size – Small household	-0.0675	-0.0544	-0.1141	-0.0507	-0.0035	-0.0189
Household income - High	-0.2315	0.0146	-0.1095	-0.0068	-0.3615	-0.0127
Household income - Low	0.4268	0.0452	0.2043	0.0473	0.3679	0.0979
Household income - Medium	-0.0039	0.0224	0.0925	-0.0157	0.206	-0.0487
Household income – Very High	-0.4053	-0.1315	-0.3525	-0.0436	-0.4934	-0.065
Region – England	-0.9949	-0.0985	-0.96	-0.158	-0.9517	-0.133
Region – Norther Ireland	0.4405	0	0.4718	0.0778	0.4959	0.1115

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Region – Wales	0.6571	0.1044	0.5919	0.0973	0.5614	0.0403
Gender – Female	-0.6729	-0.0762	-0.5308	-0.071	-0.5418	-0.0472
Gender – Male	0.69	0.0762	0.5493	0.071	0.5477	0.0472
Gender – Other	-0.254	0	-0.176	0	-0.1276	0
Education - Entry level education (NQF Levels 1, 2, 3)	0.4483	-0.0551	0.2794	0.0462	0.5083	-0.0478
Education - Entry level education (NQF Levels 4, 5, 6, 7, 8)	-0.5056	0	-0.2873	-0.0863	-0.5849	-0.0284
Education – No qualifications	0.1513	0.1328	0.0263	0.099	0.1996	0.1844
Age 18-19	-0.0523	0	-0.3376	0	-0.8225	-0.2133
Age 20-29	-0.1544	-0.0432	-0.2975	-0.0201	-0.855	-0.1687
Age 30-39	-0.053	-0.0929	0.0552	-0.0433	-0.0946	0.0672

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Age 40-49	-0.2084	-0.0967	0.1431	0.0129	0.0444	-0.036
Age 50-59	-0.0055	-0.0396	0.0501	0.0062	0.1586	-0.0803
Age 60-69	0.2471	0.1007	0.097	0.0528	0.3142	0.0874
Age 70-79	0.1727	0.1671	-0.1309	-0.0233	0.1974	0.1015
Age 80+	-0.1794	0	-0.0552	-0.0242	0.0216	0.045
Ethnicity – BAME	-0.1072	-0.0269	0.1269	0.0251	-0.1216	-0.0232
Ethnicity – Other	-0.1489	0.1229	0.0096	0.0572	0.0443	0.3199
Ethnicity – White	0.1369	0	-0.1262	-0.0369	0.1096	-0.0455
Geography - Rural	-0.1339	0.0381	-0.3285	0.0118	-0.2275	0.033
Geography - Urban	0.1339	-0.0381	0.3285	-0.0118	0.2275	-0.033
Frequency of eating out - 3-4 times a week	0.1701	0.1168	0.1106	0.0544	0.0505	0.0253
Frequency of eating out - 5-6 times a week	-0.046	-0.0754	0.0299	0	-0.0502	0.1308

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Frequency of eating out - At least once a day	-0.0306	0	0.0216	0	-0.0502	0
Frequency of eating out - Less than once a month	-0.0242	0.0405	-0.2373	0	-0.1235	0.0937
Frequency of eating out - Never	0.0025	0	0.0882	0.1029	-0.0967	-0.0383
Frequency of eating out - Once a fortnight	-0.0918	-0.0533	-0.0188	0.0186	-0.0482	-0.0694
Frequency of eating out - Once a month	-0.0956	-0.058	-0.077	-0.1148	-0.0048	-0.0881
Frequency of eating out - Once or twice a week	0.1244	0.0237	0.1867	0	0.2054	0.0411
Household size –	-0.0662	0	0.0545	0.0063	-0.0088	0.059

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Medium household						
Household size – Single household	0.2319	0.1033	0.1926	0.0541	0.2733	0.0224
Household size – Small household	-0.0675	-0.0544	-0.1141	-0.0507	-0.0035	-0.0189
Household income - High	-0.2315	0.0146	-0.1095	-0.0068	-0.3615	-0.0127
Household income - Low	0.4268	0.0452	0.2043	0.0473	0.3679	0.0979
Household income - Medium	-0.0039	0.0224	0.0925	-0.0157	0.206	-0.0487
Household income – Very High	-0.4053	-0.1315	-0.3525	-0.0436	-0.4934	-0.065
Region – England	-0.9949	-0.0985	-0.96	-0.158	-0.9517	-0.133
Region – Norther Ireland	0.4405	0	0.4718	0.0778	0.4959	0.1115
Region – Wales	0.6571	0.1044	0.5919	0.0973	0.5614	0.0403
Gender – Female	-0.6729	-0.0762	-0.5308	-0.071	-0.5418	-0.0472

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Gender – Male	0.69	0.0762	0.5493	0.071	0.5477	0.0472
Gender – Other	-0.254	0	-0.176	0	-0.1276	0
Education - Entry level education (NQF Levels 1, 2, 3)	0.4483	-0.0551	0.2794	0.0462	0.5083	-0.0478
Education - Entry level education (NQF Levels 4, 5, 6, 7, 8)	-0.5056	0	-0.2873	-0.0863	-0.5849	-0.0284
Education – No qualifications	0.1513	0.1328	0.0263	0.099	0.1996	0.1844
Age 18-19	-0.0523	0	-0.3376	0	-0.8225	-0.2133
Age 20-29	-0.1544	-0.0432	-0.2975	-0.0201	-0.855	-0.1687
Age 30-39	-0.053	-0.0929	0.0552	-0.0433	-0.0946	0.0672
Age 40-49	-0.2084	-0.0967	0.1431	0.0129	0.0444	-0.036
Age 50-59	-0.0055	-0.0396	0.0501	0.0062	0.1586	-0.0803
Age 60-69	0.2471	0.1007	0.097	0.0528	0.3142	0.0874
Age 70-79	0.1727	0.1671	-0.1309	-0.0233	0.1974	0.1015
Age 80+	-0.1794	0	-0.0552	-0.0242	0.0216	0.045
Ethnicity – BAME	-0.1072	-0.0269	0.1269	0.0251	-0.1216	-0.0232
Ethnicity – Other	-0.1489	0.1229	0.0096	0.0572	0.0443	0.3199

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
Ethnicity – White	0.1369	0	-0.1262	-0.0369	0.1096	-0.0455
Geography - Rural	-0.1339	0.0381	-0.3285	0.0118	-0.2275	0.033
Geography - Urban	0.1339	-0.0381	0.3285	-0.0118	0.2275	-0.033
Frequency of eating out - 3-4 times a week	0.1701	0.1168	0.1106	0.0544	0.0505	0.0253
Frequency of eating out - 5-6 times a week	-0.046	-0.0754	0.0299	0	-0.0502	0.1308
Frequency of eating out - At least once a day	-0.0306	0	0.0216	0	-0.0502	0
Frequency of eating out - Less than once a month	-0.0242	0.0405	-0.2373	0	-0.1235	0.0937
Frequency of eating out - Never	0.0025	0	0.0882	0.1029	-0.0967	-0.0383
Frequency of eating out	-0.0918	-0.0533	-0.0188	0.0186	-0.0482	-0.0694

Dependent variable	Pre-matched FIO	Matched FIO	Pre-matched CD	Matched CD	Pre-matched FA	Matched FA
- Once a fortnight						
Frequency of eating out - Once a month	-0.0956	-0.058	-0.077	-0.1148	-0.0048	-0.0881
Frequency of eating out - Once or twice a week	0.1244	0.0237	0.1867	0	0.2054	0.0411