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## Obesity in Scotland: A bad diet or bad supermarket promotions?

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### **Abstract:**

*Context: Scotland has some of the highest rates of obesity in Europe. It also has a diet high in calorie-dense food mainly purchased in supermarkets. Objective: This paper investigates the role of supermarket promotions on consumption of healthy/ unhealthy food in Scotland using Kantar Worldpanel data recording weekly purchases of over 3,000 households over ten-year period (2006-2015). Design: This study combines three large datasets to address important questions relating to the effect of supermarket promotions on purchases among socioeconomic classifications of food consumers. The food consumption data are combined with socioeconomic characteristics of households obtained from the Scottish Index of Multiple Deprivation and the UK FSA Nutrient Profiling to assess the impact of promotions on purchases of healthy/ unhealthy food. Subsequent analysis will be undertaken to apply the approach to the consumption of all food. Results: The preliminary results are presented from an on-going study and show that the consumption of breakfast cereals is less healthy in 2015 compared to 2006. A decrease in “full price” purchases and an increase in promotion type “price reduction” has been found across all SIMD groups. Conclusion: The results after a regression will give implication on how the purchases of healthy/ unhealthy foods are influenced through promotion types in supermarkets.*

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#248



# **Obesity in Scotland: A bad diet or bad supermarket promotions?**

## **I. Introduction**

“Globesity”, the escalating global epidemic of overweight and obesity which has tripled since 1975, with more than 1.9 billion adults being overweight and of these over 650 million obese according to the World Health Organization (2017). Scotland has one of the highest levels of obesity in Europe with over a million adults and over 150,000 children obese. The development is alarming: The obesity rate in Scotland in 1995 was 17%, in 2016 29% of the adults were obese and the situation is predicted to worsen with adult obesity levels reaching over 40% by 2030 according to various reports by the Scottish Government from 2010, 2012 and 2016. While the reasons for the worldwide obesity problem are complex, the fact that consumers purchase the majority of their food from supermarkets in many countries suggests that marketing behaviour may play a role in fashioning the diet. In Scotland, around 40% of the food and drinks purchased in supermarkets are on a price promotion. Moreover, there is some evidence that promotions are more prevalent on unhealthy foods, a recent study reporting that 50% of the less healthy products are bought on promotion compared to 30% for healthier food categories (Scottish Government, 2016).

This paper presents results from a new study investigating the role of promotions on the diet in Scotland using Kantar Worldpanel data that records weekly purchases at the barcode specific level of 3,000 households over a ten-year period. The unrivalled depth and breadth of the database, which contains some 2.3 trillion observations, is exploited to address whether supermarket promotions influence the consumption of healthy and unhealthy food in Scotland. Specifically, the paper will report results to answer the following questions: Are promotions more prevalent on unhealthy or healthy food? Does the type and intensity of promotion influence the purchases in supermarkets? Do different socioeconomic groups respond to promotions on unhealthy/ healthy food in the same way?

In order to define what constitutes a “healthy” and “unhealthy” product, this study will adapt the nutrient profiling model developed by the UK Food Standards Agency, matching the results to the products consumers actually buy. The results that will be reported in this paper will inform the debate on the role of promotions in healthy and unhealthy eating and provide evidence on the potential for price discounting to promote healthier eating, particularly among socio-economic groups exhibiting the poorest diets.

*The paper is organized as follows. Section 2 presents the supermarket promotions and their effect on different socioeconomic groups. Section 3 presents the data used in the paper, followed by a section about the methodology. In Section 5, preliminary empirical results are presented, while the last, Section 6, concludes.*

## **II. Supermarket food promotions and their effect on different socioeconomic groups**

### *II.1 Supermarket promotions*

Supermarket promotions are used to sell more products and ensure store or brand loyalty. They can also trigger unplanned and un-promoted purchases as well as encouraging stockpiling which drives retailers' costs of inventory down. Moreover, supermarkets use price promotions for strategic advantage to win retail market share (Laroche et al., (2003), Smith and Sinha (2000), Dobson (2011)). From a consumers' point of view, paying a discounted price allows the consumers to make a monetary saving. Promotion tools also make the shopping experience more interesting and provides a means of discovering new products (Laroche et al., (2003), Smith & Sinha (2000), Dobson (2011)).

According to a recent market research company report, the United Kingdom has the highest sales volume bought on promotion of 51% within Europe (Eales, 2016). The IRI-report states that the "UK retailers' strategy has been to keep base prices high and to promote down to a more realistic level. UK consumers were being 'trained' to look for deals in store and to concentrate their purchasing into promoted periods and on promoted goods" (Eales 2016, p.85).

In the United Kingdom, high promotion product categories are soft drinks, alcohol, confectionery, and meat/poultry/fish, whereas low promotion product categories are fruit and vegetables and dry grocery (Dobson, 2011). In Scotland, a report from the Food Standards Scotland using Kantar WorldPanel data (2016) which analysed data from 2010 to 2015 states that less healthy food and drinks are bought more frequently on promotion and that the promotion type "Y for £X" and "multi-buy" promotions are more prevalent in the less healthy categories. As an example, 26% of regular soft drinks were purchased through these types of promotions compared with just 4% of vegetables.

### *II.2 The effect of price promotions on the purchase of healthy and unhealthy food*

The purchase behaviour by socioeconomic groups can be linked to promotions across the healthiness of the products being bought. In the literature, promotions on foods have been investigated among different promotion types and healthiness of products.

Powell et al., (2016) studied the price promotions on food and drinks in the US and investigated the prevalence and patterns of price promotions by supermarket type, product package size and product healthfulness as well as the depth of price reductions. They looked into 44 items and they found that price promotion prevalence ranges on average across categories from "9.1% for fresh fruits and vegetables to 18.2% for sugar-sweetened beverages (SSB) in supermarkets. They claim that less-healthy products (such as sugar sweetened beverages,

high-sugar cereal, snacks, and sweets) and larger product package sizes had a higher prevalence of price promotion compared to the healthier and smaller products. Powell et al., (2016) identified that less-healthy products have a higher prevalence of being under price promotion or while others have found no significant gap in the frequency of promotions by product healthiness (Nakamura et al., 2015). No difference between the healthiness and promotions has been found by Nakamura et al., (2015) who looked into supermarket promotions of healthy and unhealthy food and linking them the consumers' responsiveness as well as their socioeconomic differences. They found that there is no significant gap in the frequency of promotion by the healthiness of products but they claim that higher sales are larger in less-healthy than in healthier categories with a price promotion. However, Nakamura et al. (2015) only looked at on or off promotion across one year and it can be criticised that they did not look into details of the promotion types. It can be seen that the findings differ in the literature, from having a higher prevalence of price promotions on unhealthy products to having no difference in the frequency of promotions by healthfulness. Steenhuis et al., (2011) identified that the most attractive marketing promotion type is a price discount on healthy food.

In the current literature no study has investigated the whole picture and combined all aspects of promotion types, their intensity and prevalence as well as socioeconomic factors together. This research will contribute to knowledge because it takes a combination of different studies into account and emphasises the greater representation when dealing with consumer behaviour. Drawing on nationwide data of Kantar Worldpanel, the objective of this study is to gain a better understanding of the influence of supermarket promotions on the purchase behaviour across different socioeconomic groups. Assessing across different types of promotions will underline the importance of the types across socioeconomic groups and product types.

### *II.3 Socioeconomic groups*

The key focus in this study is the socioeconomic background of the consumers when purchasing their foods under promotion. However, among many studies, there is no consistent characterisation of socioeconomic groups. Studies base their definition on different characteristics such as profession and income (Pechey & Monsivais (2015); Hulshof et al, 2003; Turrell et al, (2002)) or taking up to 7 different characteristics into account (Ball et al., (2015) and Whybrow et al., (2016)). Findings also differ, ranging from no connection between socioeconomic groups and food consumption to a strong and significant link (Nakamura et al. 2015; Pechey et al. 2013; Appelhans et al. 2012; Turrell et al. 2002; Ball et al. 2015; Hulshof et al. 2003).

This research uses the "Scottish Index of Multiple Deprivation" (SIMD) which is the Scottish Government's official tool for identifying those places in Scotland suffering from socio-

economic deprivation and combines several different aspects of deprivation into a single index. Specifically, these aspects are: income, employment, health, education, skills and training, housing, geographical access, and crime. This contributes to the literature in general because one or two variables alone may not be enough to categorise a household to a socioeconomic group because more factors should be taken into account which is accomplished in the SIMD.

There are recently been interest in the socio-economic dimension of The Food Standards Scotland (2016) report analysed purchasing patterns in relation to the Scottish Index of Multiple Deprivation (SIMD). Regarding the consumption behaviour across different socioeconomic groups, they state that the most deprived areas buy most of their calories in the form of confectionery, regular soft drinks and bread, whereas the least deprived households obtain more from cakes and pastries, plain starchy carbohydrates, oil-rich fish and fruit and vegetables. Moreover, they have found that the SIMD does not have an effect, or only a little, on the energy purchased on promotion and only a little variation was found in the nutrients purchased by quintile of SIMD. However, the report only gives the proportion of purchase data in percentage across different categories (such as the promotions or SIMD) and does not conduct any detailed analysis.

This paper fills this knowledge gap by examining the prevalence of supermarket promotions on healthy and unhealthy foods in Scotland, focussing on the consumption across various socioeconomic groups. It deals with the topics of promotions types, promotion intensity and prevalence in supermarkets as well as purchase behaviour across different socioeconomic groups. Prior studies have identified the relationship between supermarket promotions and the consumption behaviour. The relevance of this topic is stressed through having studies published across different disciplines such as medicine, economics or marketing in the literature and the results differ strongly across these studies.

#### *11.4 The effect of price promotions on different socioeconomic groups*

The literature gives various information on the influence of the socioeconomic background on their purchase behaviour: It spreads from no influence of the socioeconomic background on the purchase of unhealthy food on promotions to having found that lower socioeconomic groups purchase more unhealthy foods compared to higher SES (Appelhans et al., 2012; Ball et al., 2015; Hulshof et al., 2003; Nakamura et al (2015), Pechey et al., 2013; Turrell et al., 2002). Several studies are using Kantar Worldpanel data from the UK or Scotland (Nakamura et al. 2014; Pechey et al. 2013; Whybrow et al. 2016; de Roos et al. 2017; Pechey & Monsivais 2015).

According to Turrell et al., (2002), consumers from socioeconomically disadvantaged backgrounds were less likely to buy goods that were comparatively high in fibre and low in fat,

salt and sugar, generally speaking healthy foods. However, the study used a classification for healthy and unhealthy food based on an Australian healthy survey in 1995, may not reflect current diets of the various socioeconomic groups analysed. Their findings agree with a study from Ball et al, (2015), which states that consumers from a socioeconomically disadvantaged background have a lower intake of fruit and vegetables and higher intake of energy-dense, nutrient-poor food compared to less disadvantaged groups. In their study they have used characteristics such as age, country of birth, marital status, highest education qualification, household income and children at home.

Another study closely related to this study is one by Pechey et al., (2013). They looked into food purchasing patterns across different socioeconomic groups, nutritional content and Kantar Worldpanel UK data from 2010. They found out that lower socioeconomic groups purchased a greater proportion of energy from less healthy foods and beverages whereas higher groups more from healthier food and beverages. Moreover, the nutritional content varies as well across groups: They found out that higher SES groups bought per 1000 kcal more grams in fibre and a higher percentage of their energy contains total sugars and protein, and less sodium, which can lead to high blood pressure when consumed excessive.

Hulshof et al., (2003) compared the consumption of low and high SES groups and found out that lower SES groups had a higher consumption of for example potatoes, meat, visible fats whereas high SES groups consumed more vegetables and cheese. Moreover, a higher SES had higher intake of vegetable protein, dietary fibre and most micronutrients as well as a higher consumption of vegetables and fruits in general. After all, the study compared the Dutch consumption during 1987-88 to data from 1997-1998 so this study will compare more recent years and the socioeconomic groups are based on only three education/work characteristics (education, occupation and occupation position). Nakamura et al., (2015) also investigate the factor of socioeconomic differences; higher socioeconomic groups are more responsive to promotions in general on any food category. Moreover, there was no significant socioeconomic status gap in the purchases of less-healthy foods made on promotion.

When dealing with socioeconomic background, the variable “income” is highly important. Steenhuis, Waterlander, & de Mul, (2011) looked into the role of price when purchasing food among socioeconomic groups and they mention that low income consumers are significantly more conscious of value and price than higher income consumers. Turrell et al., (2002) investigated the socioeconomic patterning of food purchasing. The authors used three socioeconomic measures (education, occupation, household income) and all were significantly related to the food purchases. They found out that the economically disadvantaged households purchase fewer fruits and vegetables. All in all, in their study income was the strongest factor in the purchase of food especially fruit and vegetable– stronger than education. A study from

Hulshof et al., (2003) claims that in low income groups overweight and obesity is more prevalent than compared to higher income groups. This can be supported by Appelhans et al., (2012), they looked at relationships of SES with energy cost (\$/1000kcal) and nutrition. They came to the conclusion that higher energy cost are associated with lower total fat and higher proportions of protein, dietary fibre, and vegetables. In hand with this goes their finding that low-SES shoppers purchase calories in inexpensive forms and which are higher in fat and less nutrient-rich. But the results show that household income, was not directly related to most nutrient measures. However, they did only investigate in one American supermarket over 4 months' period and cannot be generalised.

On the contrary, a study by Ball et al., (2015) found out that among various variables the results indicated that there is no string evidence of moderation by income or education. Powell et al., (2016) defined the socioeconomic groups by quintiles of the median household income and a categorisation between urban, suburban and rural, however, they did not find a systematic variation in the prevalence of price promotions by socioeconomic characteristics.

“Education” is another significant part of the socioeconomic background. Hulshof et al., (2003) found that in the higher education groups less fat and oils were being consumed. A study from Turrell et al., (2002) identified that the least educated households purchase fewer fruits and vegetables and less regularly compared to the more educated groups. Besides this, they identified that healthier purchases were made by more-frequent trips and fewer small trips as well as visiting more store chains. Another study on the impact of the food environment on consumption is a study of Pechey & Monsivais, (2015). They investigated the importance of the supermarket choice alongside the shopping behaviour on healthfulness and social patterning using the UK Kantar Worldpanel data as well as the UK nutrient profiling score system. They have categorised M&S, Ocado and Waitrose as high-cost supermarkets, medium as Asda, The Cooperative, Morrisons, Sainsbury's, Somerfield, Tesco and low-cost as Aldi, Farmfoods, Iceland, Lidl. They found that high-cost supermarket users purchased 9 % more of energy from fruits and vegetables than low-cost supermarkets users but they found no differences among the purchase behaviour in different socioeconomic groups. The socioeconomic groups were defined into three groups (higher managerial and professional, white collar and skilled manual and semi-skilled and unskilled), giving the evidence that the socioeconomic groups mainly focussed on the education/ employment of the consumers. However, indirectly the cost of a supermarket might reflect the purchasing power through income. Besides that, Appelhans et al., 2012 identified that the indicator education was not directly related to most nutrient measures.

All in all, according to the given literature, obesity and overweight is more prevalent in low socioeconomic groups which can be explained by purchasing less fruit and vegetables, yet



more energy-dense and nutrient poor foods such as processed meat high in fats and sugar. This can be explained partly by income being the strongest factor in the purchase of food compared to education and occupation. Several studies agree that among higher socioeconomic groups, purchases contain a greater proportion of energy from healthier food and beverages especially fruit and vegetable as well as fibre and most micronutrients. Moreover, a higher percentage of their energy is obtained from sugars and protein and their higher energy cost are associated with lower total fat and higher proportions of protein, dietary fibre, and vegetables.

### *II.5 The effect of price promotions on the demand of breakfast cereals*

The above sections will be narrowed down to one food category in this paper and present the results based on the category of breakfast cereals. In the literature, studies have been conducted on breakfast cereals due to the importance as a first meal of the day and as a source of key nutrients e.g. whole grain cereals or high in fibre cereals. Moreover, this category is significant in the diet due to the wide range of consumption across all consumers – starting from young children to elderly people all over the world (De La Hunty et al. 2013; Kent et al. 2017; Williams 2014).

De La Hunty et al. (2013) examined the role of breakfast cereals on the diet and found out that a regular consumption of breakfast cereals results in a lower BMI compared to the infrequently consumers. Besides that, it showed reduced probability of overweight and obesity among the regular consumers. This can be linked literature from Galvin et al. (2003); González-Vallejo & Lavins (2016) stating that the consumption of breakfast cereals improve the dietary intakes due to its composition of carbohydrates, fats and fibre and its micronutrient-dense diet.

Various studies investigated the consumption of breakfast cereals in the diet of children. TV advertising or labelling cereals with correct health claims but limited evidence has contributed to the question of whether the socioeconomic background influences the consumption of healthy or less healthy cereals and what role price promotions play. In 1996 Jones et al. conducted a study and the results state that low-income shoppers tend to purchase the lowest priced breakfast cereal and this study will compare their results with data 20 years later. This paper will deal with the category of breakfast cereals, which includes Instant Porridge, Porridge Oats and Ready-to-eat cereal (RTEC).

### **III. Data Kantar Worldpanel (KWP) dataset**

This study analyses a secondary data source, the Kantar Worldpanel survey, which includes waves (2006-2015) of barcode-specific supermarket purchases of food by 3,000 representative households across Scotland. For each purchase the available information includes: the name of the retailer, total spent in the shop, shop address details, price details by product, promotions, and product information. This panel dataset is the result of a survey where representative households of Scotland are followed for a maximum of three years recording their food and drink purchases for consumption at home. In addition to the information about purchases, the dataset also includes household neighbourhood information (e.g., rural/urban, local authority) and socio-economic-demographic characteristics for all the households (household size).

#### *III.1 Measuring product healthiness*

In order to define “healthy” and “unhealthy” foods, it is common in the literature to use nutrient profile models. Nutrient profiling is a method for categorising foods according to nutritional quality. The current literature has been discussing various aspects of general nutrient profiling (Azais-Braesco et al., 2006, Garsetti et al., 2007; C. Julia et al., 2015; Lobstein & Davies, 2009; P Scarborough et al., 2013; P Scarborough, Arambepola, Kaur, Bhatnagar, & Rayner, 2010; Peter Scarborough, Boxer, Rayner, & Stockley, 2007; Peter Scarborough, Rayner, & Stockley, 2007).

Nutrient profiling is a way of categorising foods based on their nutritional composition. The term was first coined by the European Commission in 2003. The Food Standards Agency (FSA) in the UK has developed the model further to define healthier and less healthy foods for promotions on children’s food and regulating nutrition and health claims made on food. The model uses a simple scoring system where points are allocated on the basis of the nutrient content of 100g of a food or drink. The nutrient profile model developed by the FSA will be used in this study and is calculated on the basis of the nutritional composition in 100g of the product. Points are awarded for ‘A’ nutrients (energy, saturated fat, total sugar and sodium), and for ‘C’ nutrients (fruit, vegetables and nut content, fibre and protein). The score for ‘C’ nutrients is then subtracted from the score for ‘A’ nutrients to give the final nutrient profile score. A food is classified as “less healthy” when it scores 4 points or more and “healthier” when it scores 0 points or less. A drink is “less healthy” when it scores 1 point or more and “healthy” when it scores 0 or less. Scores for foods and beverages were based on a scale from –15 (most healthy) to +40 (less healthy). -15 is the healthiest score a product can reach due to the fact that if a product has no bad nutrients and the highest score of the good nutrients, the good

'C' nutrients (3 nutrients having the maximum of 5 points each) will be subtracted from zero 'A' nutrients. 40 is the unhealthiest score possible which can result from having all 4 bad 'A' nutrients reaching the highest score of 10 and scoring zero good nutrients, which will not subtract any points in the final calculation.

The literature compares various nutrient profiling models and the advantages of using this UK FSA nutrient profiling model are the following (Azais-Braesco et al., 2006, Garsetti et al., 2007; C. Julia et al., 2015; Lobstein & Davies, 2009; P Scarborough et al., 2013; P Scarborough, Arambepola, Kaur, Bhatnagar, & Rayner, 2010; Peter Scarborough, Boxer, Rayner, & Stockley, 2007; Peter Scarborough, Rayner, & Stockley, 2007). This FSA model has been validated by many experts across different countries and has been ranked one of the best nutrient profiling models. It has been successfully validated that other countries have used it as an example, which proves the model's success. This specific UK FSA model has been used effectively in various research studies to accurately determine the nutritional content of products due to the complexity as well as the details needed to calculate the score. Another advantage is the scoring system linked to a threshold, so products can be ranked and still be categorised as healthy or less healthy. However, to make the model more specific there is a different threshold for the food and drinks. Moreover, the general across-the-board approach to calculate with one formula for all products is seen as a positive aspect due to the aim of this research: An insight into the general consumption of households looking at the whole diet.

### *III.2 Measurement of socioeconomic status*

The socioeconomic status can be defined through various variables. The household's characteristics given in the dataset are for example age of the head of household, sex, number of children, income groups, rural and urban code and will be combined throughout the analysis.

#### **1. Socioeconomic position**

In order to define a socioeconomic position mostly in the literature (e.g. Nakamura et al. 2013) can be found the following method: The classes are divided into three groups based on the UK Registrar General's social classes.

1. Advantaged: Professional or higher managerial
2. Middle: skilled non-manual or skilled manual
3. Less advantaged: semi-skilled or unskilled manual

## 2. Scottish Index of Multiple Deprivation

The Scottish Index of Multiple Deprivation (SIMD) is the Scottish Government's official tool for identifying those geographic areas in Scotland suffering from deprivation. It incorporates several different aspects of deprivation, combining them into a single index. There are seven domains which are income, employment, health, education, skills and training, housing, geographical access and crime.

It divides Scotland into 6,505 small areas, called data zones, each containing around 350 households. The Index provides a relative ranking for each data zone, from 1 (most deprived) to 6,505 (least deprived).

This research uses groups from 1 to 5 to have an appropriate measure of the deprivation status. Quintile 1 means the fifth most deprived areas within Scotland and the 5<sup>th</sup> Quintile refers to the fifth least deprived areas. It is important to stress the fact that SIMD is not equal to income as it is only one part out of different components.

### *III.3 Measurement of promotions*

There are various types of supermarket promotions. The most common ones in the United Kingdom are the price discount, the multi-buy and the x for y pounds. One type of the examined supermarket promotions are the temporary price reductions (TPR). Through a monetary reduction in the regular price the consumers can purchase a product cheaper than they normally could. A multi-buy is a common promotion tool which is for example *buy one, get one free* and another promotion tool is the “Y for £X” meaning an offer of buying a number of products for a set price such as buying 3 products for 1 pound.

In this study four promotion types will be used and they will be categorised as following:

- No promotion
- Price discount
- Multi-buy
- Y for x £

This paper will deal with the category of breakfast cereals. This general category includes three main groups given from the Kantar data: Instant Porridge, Porridge Oats and Ready-to-eat cereal (RTEC). These three categories have been divided into a standard and a healthy category. In the data set can be found annual data from 2005 to 2015 dealing with expenditure, weighted prices, and promotions as well as various household characteristics.

## **IV. Methodology**

### *Empirical strategy*

The paper will report results to answer the following questions:

- Are promotions more prevalent on unhealthy or healthy food?
- Does the type and intensity of promotion influence the purchases in supermarkets?
- Do different socioeconomic groups respond to promotions on unhealthy/ healthy food in the same way?

Using panel data estimation methods, we regress purchased products in the Kantar Worldpanel data for Scotland by socioeconomic and demographic household variables, such as household size, age, gender and education of the household. This study models the purchase quantity, the household characteristics and the product choice by healthy or unhealthy category. The number and types of promotions are measured within various food categories but will in the preliminary results focus on breakfast cereals. The products in this category will be categorised as either healthy or unhealthy, according to set criteria of the UK FSA Nutrient Profiling model. The type of promotional method will be used to categorised by four promotional tools: Full price, price discount, multi-buy or y for x £. Prior to the formal analysis of the data, a brief description of some key features of the data will be presented.

## **V. Preliminary Results**

The following results are based on 7.500 products in the category breakfast cereals and breakfast cereals were purchased by 1857 household in 2015 in Scotland. Overall, the Scottish Index of Multiple Deprivation (SIMD) shows the distribution across Scotland, 16% living in most deprived areas and 19% in least deprived areas of Scotland. Table 1 gives an overview of the household characteristics across the Kantar Worldpanel data of 2015.

Table 1. Descriptive statistics for the Household characteristics in 2015 of breakfast cereals (n = 1857)

<b>Variable</b>	<b>n</b>	<b>Mean</b>	<b>St. D.</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Age (Head of Household)</b>					
<b>Age (Head of Household)</b>	1857	54.0734	14.26048	18	90
<b>Sex</b>					
(1 = Female; 2 = Male)	1857	1.2663	0.4420	1	2
<b>Body Mass Index (BMI)</b>					
<b>Total</b>	<b>247</b>	<b>26.2508</b>		<b>15.1</b>	<b>49.8</b>
Underweight (Below 18.5)	7	3%			
Normal (18.5-24.9)	105	43%			
Overweight (25.0-29.9)	91	37%			
Obese (30.0 and above)	44	18%			
<b>Scottish Index of Multiple Deprivation (SIMD)</b>					
<b>SIMD</b>		<b>3.0756</b>	<b>1.3628</b>	<b>1</b>	<b>5</b>
Quintile 1 (most deprived)	281	16%			
Quintile 2	382	22%			
Quintile 3	360	21%			
Quintile 4	367	21%			
Quintile 5 (least deprived)	320	19%			
<b>Income groups</b>					
<b>Total</b>	<b>1857</b>	<b>2.9738</b>	<b>2.0151</b>	<b>0</b>	<b>8</b>
0 Refused answer/ Does not know	210	11%			
1 £0 - £9,999 pa	159	9%			
2 £10,000 - £19,999 pa	431	23%			
3 £20,000 - £29,999 pa	377	20%			
4 £30,000 - £39,999 pa	276	15%			
5 £40,000 - £49,999 pa	184	10%			
6 £50,000 - £59,999 pa	114	6%			
7 £60,000 - £69,999 pa	44	2%			
8 £70,000+ pa	62	3%			

Another analysis looks at the consumption of healthy and standard breakfast cereals across socioeconomic background. This will divide the population by the Scottish Index of Multiple Deprivation and evaluate their purchases of healthy and standard breakfast cereals across three subcategories (Instant Porridge, Porridge oats, Ready-to-eat cereals). Table 2 compares the five SIMD levels of Scotland by reporting the percentage share of the expenditure in each category and each promotion type. The purchases are associated with a higher expenditure on standard breakfast cereal compared to healthy breakfast cereals, especially when comparing 2006 to 2015.

When looking at the total expenditure of breakfast cereals as a category and the distribution of the purchases across promotion tools it shows that 57% of the total breakfast cereals were bought at full price in 2015, 32% of the total breakfast cereals are bought under a price reduction, 9% under a multibuy and 1% under y for x £ in 2015. Interestingly, this does hardly vary across the different SIMD Quintiles showing that there is little effect of price promotions on different socioeconomic groups. The results on the shares of expenditure are very similar between each quintile. All of them show a decrease in the purchases of full price products and an increase in the promotion type “price reduction” across the quintiles and across the years.

Table 2. Percentage change of the annual expenditure of total, healthy and standard breakfast cereals (BC) divided into four promotion types from 2005 compared to 2015 across the five SIMD levels

	SIMD 1		SIMD 2		SIMD 3		SIMD 4		SIMD 5	
	2006	2015	2006	2015	2006	2015	2006	2015	2006	2015
	(n=138; 16%)	(n=281; 16%)	(n=189; 21%)	(n=382; 22%)	(n=197; 22%)	(n=360; 21%)	(n=186; 21%)	(n=367; 21%)	(n=177; 20%)	(n=320; 19%)
<b>Total BC</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
Full price	74%	59%	74%	55%	73%	58%	74%	57%	74%	58%
Price reduction	12%	31%	12%	31%	12%	33%	11%	33%	11%	31%
Multibuy	11%	9%	10%	11%	11%	9%	10%	9%	11%	10%
y for x £	3%	2%	3%	3%	4%	1%	4%	1%	3%	1%
<b>Healthy BC</b>	<b>20%</b>	<b>10%</b>	<b>21%</b>	<b>15%</b>	<b>26%</b>	<b>17%</b>	<b>25%</b>	<b>16%</b>	<b>31%</b>	<b>19%</b>
Full price	75%	56%	74%	56%	72%	51%	77%	60%	78%	55%
Price reduction	11%	29%	12%	29%	12%	31%	10%	29%	10%	30%
Multibuy	13%	14%	13%	15%	15%	18%	13%	11%	11%	15%
y for x £	0%	1%	0%	0%	1%	0%	1%	0%	1%	0%
<b>Standard BC</b>	<b>80%</b>	<b>90%</b>	<b>78%</b>	<b>86%</b>	<b>73%</b>	<b>84%</b>	<b>75%</b>	<b>84%</b>	<b>69%</b>	<b>81%</b>
Full price	74%	59%	75%	55%	74%	59%	74%	56%	72%	59%
Price reduction	12%	31%	12%	31%	12%	33%	11%	34%	12%	32%
Multibuy	10%	8%	10%	10%	9%	8%	9%	9%	11%	9%
y for x £	4%	2%	4%	3%	6%	1%	5%	1%	5%	1%

Examining the various deprivation levels in Scotland, SIMD 1, meaning the most deprived areas in Scotland, reduced their consumption of 20% on healthy cereals to 10% of the total expenditure on the total category of breakfast cereals comparing 2005 and 2016. The promotion type preference changes relatively equal across the healthiness e.g. about 15 to 20% less has been bought under the full price, but has increased in the price reduction by about 20%. The same effects can be seen across all five SIMD levels. SIMD 5 as the least

deprived area in 2015 has the highest share of healthy breakfast cereals compared to the other SIMD categories, having 19% healthy cereals, and has increased with increasing level of deprivation (from quintile 5 to quintile 1 of SIMD). However, compared to 31% in 2006, the consumption was healthier in 2006 compared to 2015.

Looking into the promotion types and the influence on the purchase behaviour as visualised in Graph 1, the promotion tool “multibuy” has been purchased a lot more frequently among the healthy breakfast cereals compared to the standard breakfast cereals. Moreover, it is used more among less deprived quintiles, especially in the healthy categories. The promotion tool “y for x £” is hardly relevant in the purchases of breakfast cereals, especially in the healthy category across the ten years and is barely prevalent in 2015 across all groups.

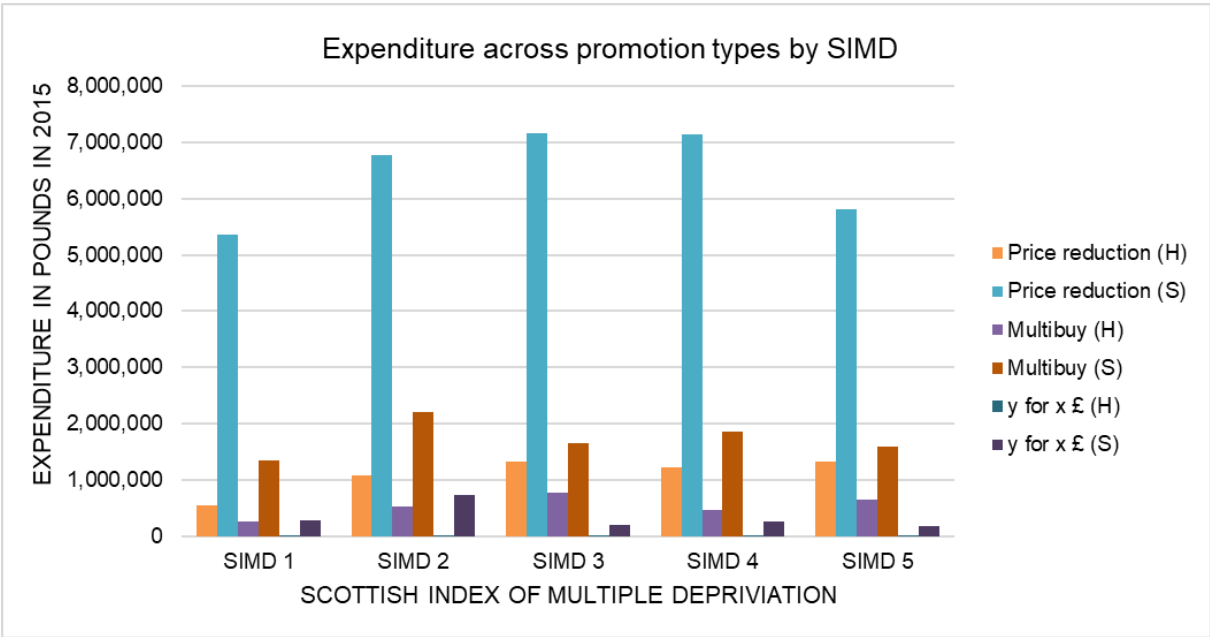
These finding support the literature, that consumers of breakfast cereal are healthier and less overweight or obese. Based on the panel data the consumers with a normal BMI were mainly in the higher SIMD groups and the highest expenditure on healthy cereals is in SIMD 5 compared to the other quintiles as seen in Table 3.

Table 3. Comparison between the shares of the healthy breakfast cereals of the total category comparing 2006 to 2015 across the SIMD quintiles.

	Share of the healthy breakfast cereals from the total Breakfast Cereal expenditure 2006	Share of the healthy breakfast cereals from the total Breakfast Cereal expenditure 2015	Change 2006 to 2015 (in percentage points)
<b>SIMD 1</b>	20%	10%	- 10%
<b>SIMD 2</b>	21%	15%	- 6%
<b>SIMD 3</b>	26%	17%	- 9%
<b>SIMD 4</b>	25%	17%	- 8%
<b>SIMD 5</b>	31%	19%	- 12%



Graph 1. Expenditure in £ (2015) across promotion types by Scottish Index of Multiple Deprivation



**VI. Conclusion**

This study, which is at an early phase, investigates the role of supermarket promotions on the consumption in Scotland using Kantar Worldpanel data that records weekly purchases at the barcode specific level of over 3,000 households over a ten-year period. Preliminary results are currently available for the category of breakfast cereals, which includes Instant Porridge, Porridge Oats and Ready-to-eat cereal (RTEC). First results show that the consumption of breakfast cereals is less healthy in 2015 compared to 2006 across all Scottish Index of Deprivation levels.

Four promotion types are included in the investigation and preliminary results demonstrate that fewer products have been bought at “full price” and more on “price reduction” across all SIMD groups and all years. The promotion type “multibuy” was strongest among the healthy breakfast cereals in the less deprived quintiles, which can be underlined by the fact that the normal BMI was more prevalent in higher, less deprived, SIMD quintiles as well. The next step will be to investigate these relationships in more detail using panel data estimation.

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