The 84th Annual Conference of the Agricultural Economics Society

Edinburgh

29th to 31st March 2010

An Analysis of the Consumption of Sausages in Scotland using Supermarket Data

Cesar Revoredo-Giha, Beata Kupiec-Teahan, Wendy Wrieden, Victoria Davis, Anne Milne and Philip Leat

Corresponding author: Cesar Revoredo-Giha
Food Marketing Research Team
Land Economy and Environment Research Group
Scottish Agricultural College (SAC),
King's Buildings, West Mains Road,
Edinburgh EH9 3JG, UK
Cesar.Revoredo@sac.ac.uk

Abstract

This paper addresses consumers' choices by looking into: current food choices made by different socio-economic groups; price barriers for diet improvement; and ways in which marketing may affect product choice. The study seeks: first, to analyze the differences in consumption of sausages of different nutritional composition among different socio-demographic and lifestage groups; and second, to measure whether it is possible to improve diet quality without affecting household expenditure. Sausages represent a relatively high proportion of red and processed meat purchases in Scotland, contributing significantly to the fat and sodium in the Scottish diet. The data used consisted of two-years of weekly information from a top-4, UK supermarket. The results suggest that it is possible to purchase similar quantities of a lower saturated fat or lower sodium sausage for the same price as a higher saturated fat or sodium sausage. However, it would cost more for some the groups to replace both a lower saturated fat and a lower sodium sausage in the household's food basket.

Keywords: Scotland, saturated fats, sodium, consumer choices, sausages consumption

JEL codes: D1

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1. Introduction

Diet has an impact on health and this on the public budget; therefore, it is important to track changes in the diet of the population and in sub-groups of the population so as to target appropriate advice and interventions. As supermarket chains dominate food sales in the UK, data from these outlets regarding purchases of different product and groups is very useful for tracking consumers choice and see how far consumers are from the health authority's recommendations.

This paper derives from the project "An Exploration of the Use of a Dataset of Supermarket Purchases for the Analysis of Red Meat Purchases in Scotland" (Revoredo-Giha et al, 2009) commissioned by the Food Standards Agency Scotland (FSAS). It has the purpose of analysing the choice of sausages according to their nutritional characteristics, and to assess whether it is possible to improve the nutritional quality of the choice without increasing the expenditure in the category. The expenditure dimension is important as pointed out by Darmon and Drewnowski (2008) as promotion of high-cost foods to low-income people without taking food costs into account is not likely to be successful.

The choice of sausage products for the analysis was due to two reasons. First, they represent an important component of red meat purchases in Scotland. Second, sausages are also quite variable in terms of their fat and sodium content. Differences in the composition of the purchases by different sub-groups of the population might therefore be important from a health perspective. Furthermore, fat intake has been identified as one aspect of the Scottish diet to be targeted for change and that includes a reduction in the consumption of sausages by 50 per cent (Matthews et al., 2003).

Lowering the level of fat in sausages can significantly decrease their energetic and cholesterol content. (Hoelscher et al. 1987, Chizzolini et al. 1999, Cengiz and Gokoglu, 2004). Low sodium products help to decrease its level in the human body improving cardiovascular system especially with regards to lowering blood pressure (Ruusunen and Puolanne, 2005, Daviglus and Pirzada, 2008). However, the choice is not as simple as apart from the nutrition and health aspect of fat and salt reduction, their changes in food also have an impact on sensory, safety, technological legal and especially cost factor (Colmenero, 2000).

It should be pointed out that the current economic situation seems to have triggered the increase in the consumption of sausages. Thus, the UK food and grocery market grew

[1] Dr. Cesar Revoredo-Giha, Dr. Beata Kupiec-Teahan and Mr. Philip Leat are with the Scottish Agricultural College (Edinburgh), Dr. Wendy Wrieden is with Robert Gordon University (School of Pharmacy and Life Sciences, Aberdeen) and Dr. Victoria Davis and Ms. Anne Milne are with Food Standard Agency - Scotland. Corresponding author: Dr. Cesar Revoredo-Giha, Food Marketing Research, Land Economy and Environment Research Group, Scottish Agricultural College, King's Buildings, West Mains Road, Edinburgh EH9 3JG, (44-131) 535 4344, Cesar.Revoredo@sac.ac.uk.

by 4.9 per cent over 2008, with growth driven by rapid food price inflation (KeyNote, 2008). In response to this, consumers started controlling their spending more and modified their purchase behaviour. In 2006 UK consumers spent more on meat than on any other category of food (£14 bn), with the exception of fruit and vegetables (which accounted for £15.5bn of consumer expenditure that year). As sausages are cheaper alternative to most of meat cuts and bacon, significant increases in food prices are likely to stimulate purchases of sausages. Indeed, there was a 2 per cent increase in quantity of sausage purchased in the UK between 2008 and 2009 (AHDB, 2009). In the same period, the average price of sausages increased by12 per cent and the expenditure by 11 per cent. It should be noted that fresh and frozen meat purchases went down by 2 per cent, with prices increasing by 10 per cent and expenditure by 8 per cent (ADHB, 2009). At present sausages belong to so called 'Cheapest On Display' food (COD[2]) the category occupying more shelf space, as most consumers want to buy their staple food cheaply (Mintel, 2008b). Meat in COD food category apart from sausages is represented by processed red meat products including sausages, tinned meat and pies.

The structure of the paper is the following: it starts with a literature review of the consumption of sausages; next, the methodology used in the paper is presented, followed by results and discussion. Finally, conclusions are presented.

2. Literature review

The diet in Scotland, together with smoking, has been cited as one of the main contributors to high rates of chronic diseases such as coronary heart disease, obesity, type 2 diabetes, hypertension, stroke and certain types of cancer (The Scottish Office, 1993; The Scottish Office, 1996; The Scottish Executive, 2003).

A previous report on the Scottish Diet (The Scottish Office, 1993) identified targets for reducing consumption of processed red meat. It was recommended that the intake of processed red meat and sausages should be halved and the intake of bacon and ham should be decreased by 20 per cent. These recommendations were aiming to reduce the intake of fat and saturated fatty acids, which are thought to be contributing to high rates of heart disease and obesity. Also, the World Cancer Research Fund (WCRF, 2007) highlighted the evidence that consumption of red and processed red meat (including bacon and ham) is likely to increase the risk of colorectal cancer and recommended to limit the consumption of red meats (mainly beef, pork and lamb) and avoid consumption of processed meats. Research into healthy food consumption and cancer interdependence is especially important for decision makers in developed countries where adverse dietary patterns are prevalent (Cross et al., 2007).

In contrast to the health recommendations, which suggested a reduction in the consumption of processed meat and sausages by half and bacon and ham by 20 per cent, a review of food consumption in Scotland carried out in 2006 (Wrieden et al,

[2] Cheapest on display retail price, are the cheapest of their category available in a given store or group of stores. Other descriptors include budget and economy, but the products are generally recognisable by basic pack design, consistent across a wide variety of product types, and uncomplicated product information – baked beans; cheese; or cola, for example" Jimenes-Colmenero (2000).

2006) and based on Expenditure and Food Survey (EFS) 2003/2004 data, showed that the population's mean consumption of processed red meat (including burgers and meat pies) and sausages and bacon and ham had actually increased. For processed ham and sausages the mean consumption in 2003/04 was 55g per week whilst in 1996 it was 52g per week, and for bacon and ham was 16g per week in 2003/04 in comparison to 12g per week in 1996.

The aforementioned review also showed that higher amounts of processed meat and sausages were consumed in more deprived areas. The consumption of processed meat was higher in the consumer segments with lower affluence (the mean consumption was 64g a week in the lowest quintile of the Scottish Index of Multiple Deprivation (SIMD) (Scottish Government, 2009).

Overall, higher-quality diets are associated with higher income, higher social standings and education. Energy-dense (nutrient-poor) diets are associated with lower socio-economic groups with limited disposable income (Inglis et al., 2005). Personal disposable income (PDI) therefore, is a major predictor used to forecast consumption of nutrient-rich foods as it determines the consumers' ability and willingness to trade up to premium, higher value options and to absorb any price rises. Red meat is a particular example of such foods. Recent trends indicate that consumers are reducing expenditure on more expensive meat cuts and meat products, and looking for cheaper outlets in order to control household food budgets (Revoredo et al., 2009).

While socio-economic differences in dietary intake are well documented, relatively little is known about their underlying causes. Amongst the reasons for such variations are the cost differentials between energy-dense and nutrient-dense foods (Maillot et al., 2007), physical access to healthy food options (neighbourhood effect), acquired taste (sensory preferences) and nutritional habits and traditions (Rozin, 2007). For example, in the UK 25 per cent of red meat consumers consider red meat consumption as driven by taste and cannot see any alternative to this product category. Men tend to be more loyal to specific meat product categories and have their preferences rooted firmly in nutritional habits acquired in childhood and adolescence (Mintel, 2008a). Consumer preferences differ in different regions. For example, there are specific differences between Scotland and the rest of the UK with regards to specific meat products, such as canned meat or Scottish preference for locally produced lamb and beef.

Sensory preferences and familiarity with the product are also important factors that are likely to affect especially repeated purchase decision. Different groups of consumers are likely to react differently to the information about fat and or salt reduction e.g women usually being more sensitive to fat reduction incentive (Kähkönen and Tuorila, 1999) consumers in general having positive attitude towards the premium products (Ressureccion, op. cit.) etc. In palatabilty and preference tests low fat/low salt sausages can be easily liked by consumers under the condition that sensory characteristics is close enough to the standard recipe products (Solheim and Ellekjær, 1993). In the UK consumer tests have shown that low fat sausages can achieve same level of likeability as their standard counterparts (Homer et al. 2000).

Recent review of eating quality of the UK style sausages that included standard, premium and healthy eating products available stocked by 10 major retailers in the UK was carried out by Sheard et al. (2010). British sausages sold in three major categories:

standard, premium and healthy option (lower fat or salt) can be categorised with regards to their sensory profile on the basis of meat and fat content and their price.

To conclude this discussion – there is a need for better quality processed meat to be available in the market place in order to improve diet of especially poorer groups of consumers in Scotland. However technological and sensory implications of such changes in product may involve significant cost increase that in turn passed onto customers can impair purchase of lower fat/salt products by low income segment of the consumers.

3. Methodology

3.1 Data

The data used for the analysis were provided by the Centre for Value Chain Research (VCR^2), Kent Business School for the study "An Exploration of the Use of a Dataset of Supermarket Purchases for the Analysis of Red Meat Purchases in Scotland" (Revoredo-Giha et al, 2009). They consisted of two-years of weekly information (corresponding approximately to the years 2007 and 2008) from a major supermarket (amongst the top-4 supermarkets in the UK). These were aggregated-over-customers data supplied in bespoke reports. The raw data (the raw panel dataset with information for each customer) were not accessible. It is important to note that the recorded transactions corresponded to a sample of customers owning and using a loyalty card.

The data on purchases of sausages included four variables related to sausage product category, namely: total expenditure (£); number of purchased units; number of customers and price (£/unit). In addition, information about the total number of customers purchasing sausages for each one of the groups analysed was extracted.

The list of sausages in the database was sorted according to the expenditure on them. From the universe of sausages only those accounting for 0.5 per cent or more of the expenditure on sausages were used in the analysis. For the selected set of sausages information about their nutritional content was collected from the manufacturer or supermarket websites and product labels. This information consisted of four indicators: percentage of energy derived from saturated fat, saturated fat content per 100g, sodium content per 100g and price per 100g.

The data was available according to two different classifications: lifestage and a geo-demographic classification CAMEO. Tables 1 and 2 present the two classifications with a brief explanation of the categories. It should be noted that although there was a description for all categories in the two classifications, there was not a quantitative description of the categories. For instance, there was no available information on the number of members in the households, number of children, etc. This was a shortcoming of the dataset for its use in the analysis of nutritional issues.

Table 1: Lifestage classification of customers

Lifestage segment	% of Customers	Age & family
Young Adults	14.5%	Adults aged 20 -39 with no children
Older Adults	14.0%	Adults aged 40 -59 with no children
Young families	16.8%	Adults with all children under 10
Older families	15.7%	Adults with one or more child over 10
Pensioners	10.7%	Adults over 60 with no children
Mixed	28.4%	Multigenerational households

Source: The Centre for Value Chain Research (VCR^2), Kent Business School.

Table 2: The CAMEO UK classification

CAMEO CODE	CAMEO *UK* TYPE	% OF UK HHOLDS	CHILD AGE	ADULT AGE	FAMILY COMPOSITION	HOUSING TYPE	GEOGRAPHICAL AREA	SOCIAL GROUP	QUALIFICATIONS	EMPLOYMENT TYPE	NEWSPAPER READERSHIP	INTERNET USAGE	MAIL ORDER RESPONSIVE
1	AFFLUENT SINGLES & COUPLES IN EXCLUSIVE URBAN NEIGHBOURHOODS	3.44	Few Children	20-59 yrs	Singles & Couples	Terraced / Flats	Inner City / Suburbs	ABC1	Very High	Professional / White Collar	Quality	Very High	Low
2	WEALTHY NEIGHBOURHOODS NEARING & ENJOYING RETIREMENT	3.64	5-15 yrs	40+ yrs	Older Singles, Couples & Families	Detached / Semi-Detached	Suburbs / Rural	ABC1	High	Professional / White Collar	Quality	Above Average	Average
3	AFFLUENT HOME OWNING COUPLES & FAMILIES IN LARGE HOUSES	10.14	5-19 yrs	30-64 yrs	Couples & Families	Detached / Semi-Detached	Rural	ABC1	Above Average	Professional / White & Blue Collar	Regional / Quality	High	High
4	SUBURBAN HOMEOWNERS IN SMALLER PRIVATE FAMILY HOMES	13.27	0-15 yrs	30-74 yrs	Singles, Couples & Families	Detached / Semi-Detached	Small Towns / Suburbs / Rural	ABC1	Above Average	Professional / White & Blue Collar	Regional / Mid Market / Quality	High	High
5	COMFORTABLE MIXED TENURE NEIGHBOURHOODS	8.42	5-15 yrs	30-74 yrs	Singles & Couples, Some Retired	Detached / Semi-Detached / Flats	Small Towns / Suburbs / Rural	ABC1C2	Average	Professional / White & Blue Collar	Regional / Quality	Average	Low
6	LESS AFFLUENT FAMILY NEIGHBOURHOODS	16.48	5-19 yrs	30-64 yrs	Singles, Couples & Families	Semi-Detached / Terraced	Small Towns / Suburbs	C1C2D	Below Average	Professional / White & Blue Collar	Mixed	High	High
7	LESS AFFLUENT SINGLES & STUDENTS IN URBAN AREAS	5.70	0-19 yrs	20-44 yrs	Singles, Couples & Students	Terraced / Flats	Inner City / Suburbs	BC1D	Above Average	Professional / White & Blue Collar	Mixed	Above Average	Low
8	POORER WHITE & BLUE COLLAR WORKERS	16.69	0-15 yrs	35-59 yrs	Singles, Couples & Families, Some Retired	Semi-Detached / Terraced	Small Towns / Suburbs	C1C2D	Below Average	Professional / White & Blue Collar	Regional / Mid Market / Popular	Above Average	High
9	POORER FAMILY & SINGLE PARENT HOUSEHOLDS	10.69	0-19 yrs	20-59 yrs	Singles, Couples & Families, Some Single Parents	Semi-Detached / Terraced / Flats	Small Towns / Suburbs	C1C2D	Low	White & Blue Collar / Unskilled	Popular	Low	Average
10	POORER COUNCIL TENANTS INCLUDING MANY SINGLE PARENTS	11.53	0-19 yrs	20-59 yrs	Singles & Single Parents, Some Retired	Terraced / Flats	Small Towns / Suburbs	C2DE	Very Low	White & Blue Collar / Semi & Unskilled	Popular	Low	Average

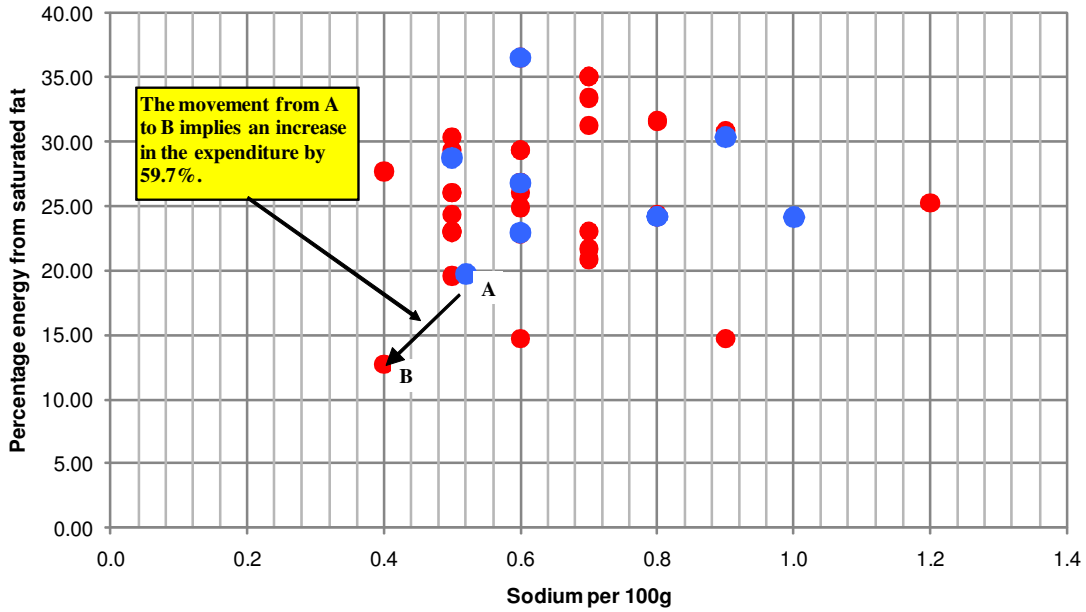
Source: The Centre for Value Chain Research (VCR^2), Kent Business School.

3.2 Methods

The methodology used consisted of studying the expenditure of each group (i.e., CAMEO and lifestage) against a healthy "frontier" of sausages constructed based on two indicators: the percentage of energy derived from saturated fat, and the sodium content per 100g. This helped to identify the healthiest choice and the best choice considering only one of the mentioned indicators.

Figure 1 represents the type of analysis done. The blue dots represents the top 10 sausages in terms of expenditure (and the red the remaining ones). The sausage named as 'B' was the healthiest one as had both the lowest percentage of energy derived from saturated fat, and the sodium content per 100g. Thus, the interest in the analysis was to study the movement in terms of expenditure from the blue dots to the dot 'B'.

Figure 1: Relationship between percentage of energy from saturated fat and sodium per 100g (excluding salami)



4. Results and discussion

Table 3 presents expenditure share, the energy from saturated fat, and sodium of the most bought sausage per group. Clearly, from a health point of view there is an ample margin for improvement. However, it is necessary to analyse whether this can be done without a substantive increase in the expenditure.

A shown in Table 3, based on the lifestage classification, i.e., older families and young adults are the ones with the poorest choice (in health terms, i.e., as regards the percentage of energy from saturated fats and the quantity of sodium) of sausages. In comparison to these groups, young families choose a healthier option; however, it still could be improved when compared with the healthiest option.

As regards the CAMEO categories, groups 4 and 7 (i.e., Less Affluent Singles and Students and Poorer White and Blue Collar Workers, respectively) are ones with the unhealthiest choice. Note however, that socioeconomic status does not necessarily

imply unhealthy choice as several poorer groups (e.g., Poorer Council Tenants - Many Single Parents) chose a sausage with less fat than more affluent groups (e.g., Affluent Home-Owners). It is interesting to note that the wealthier groups (i.e., Affluent Home-Owners, Wealthy Retired Neighbourhoods and Young and Affluent Singles) had as their first choice sausages with lower sodium content.

In addition to Table 3, four comparisons were made to analyse the change in expenditure towards a movement to healthier choices. First, how each one of the lifestage and CAMEO groups ranked the healthiest choice in their expenditure (Table 4); second, the change in expenditure per 100g by lifestage and CAMEO group with respect to the healthiest choice (Table 5); third, the change in expenditure per 100g by lifestage and CAMEO category with respect to the choice with the second least fat (Table 6), and fourth, was similar to the previous one but with respect to the choice with the second least sodium (Table 7).

Table 4 comprises three panels. The first panel shows the ranking of the healthiest sausage according to the lifestage and CAMEO classifications. The second and the third panels show similar information by with respect to the second sausage with the least of fat and with the second least sodium, respectively.

None of the groups lifestage or CAMEO had the healthiest sausage amongst the top 10 and when all the groups are put together it comes in ranking 16. Similar result is obtained with respect to the second healthiest sausage as respect to fat. In the case of sausage with the second lowest sodium content, none of the lifestage categories selected it, however in the case of the CAMEO groups, it was the wealthier groups the ones that came closer (ranked 9 in group 1, 7 in group 9 and 12 in group 10).

Tables 5, 6 and 7 are similar in the sense that they measure the change in expenditure per 100g of moving from different choices per group (ranked by expenditure) to the healthiest sausage, to the one with second healthiest with respect to fat and to the second healthiest with respect to sodium content. For instance, the first row of table 5 shows the change of each one of the groups would need to do in their expenditure to move from the sausage that the highest share to the healthiest one. Thus, if all the categories are considered, consumers would require increasing their expenditure by 16 per cent to move to replace it for the healthiest sausage.

Table 5 shows that it is possible for some of the groups to move from the current top 10 sausages to the healthiest without increasing their expenditure. If one concentrates the analysis to the sausage with the highest expenditure share, then one can see that groups 1 and 4, in the lifestage group (i.e., those with the worst choice on health terms) could improve their choice in terms of health and also reduce their expenditure.

Similar to the previous result, some groups under the CAMEO classification could improve their choice in term of health and save money. This is particularly important for groups with poorer income such as group 4 and group 7, although it is true for the most affluent categories (groups 1, 9 and 10).

Table 3: Expenditure, energy from saturated fat, and sodium of the most bought sausage per group

Lifestage Group	Expenditure share %	Energy from saturated fat %	Sodium per 100g (g)	CAMEO Group	Expenditure share %	Energy from saturated fat %	Sodium per 100g (g)
Group 1	6.29	30.37	0.90	Group 1	7.00	28.72	0.50
Group 2	6.84	24.18	0.80	Group 2	6.58	24.18	0.80
Group 3	9.92	24.18	0.80	Group 3	6.47	24.18	0.80
Group 4	6.35	30.37	0.90	Group 4	6.12	30.37	0.90
Group 5	6.77	22.94	0.60	Group 5	7.03	24.18	0.80
				Group 6	7.08	24.18	0.80
				Group 7	5.72	30.37	0.90
				Group 8	6.41	24.18	0.80
				Group 9	7.25	28.72	0.50
				Group 10	6.70	28.72	0.50
Altogether	6.49	24.18	0.80	Altogether	6.49	24.18	0.80
Healthiest	1.80	12.70	0.40	Healthiest	1.80	12.70	0.40

Source: Own based on FSAS(2009) dataset.

Note: Ranking with respect to 49 products.

Table 4: Rankings of healthy sausages on expenditure

Healthiest sausage				Sausage with the second least fat				Sausage with the second least sodium			
Lifestage Group	**Ranking**	**CAMEO Group**	**Ranking**	**Lifestage Group**	**Ranking**	**CAMEO Group**	**Ranking**	**Lifestage Group**	**Ranking**	**CAMEO Group**	**Ranking**
Group 1	17	Group 1	28	Group 1	20	Group 1	19	Group 1	18	Group 1	9
Group 2	16	Group 2	15	Group 2	18	Group 2	19	Group 2	15	Group 2	17
Group 3	16	Group 3	16	Group 3	20	Group 3	26	Group 3	19	Group 3	20
Group 4	17	Group 4	20	Group 4	22	Group 4	25	Group 4	14	Group 4	13
Group 5	17	Group 5	13	Group 5	19	Group 5	27	Group 5	20	Group 5	35
		Group 6	16			Group 6	21			Group 6	24
		Group 7	16			Group 7	27			Group 7	20
		Group 8	13			Group 8	18			Group 8	19
		Group 9	22			Group 9	25			Group 9	7
		Group 10	27			Group 10	25			Group 10	12
Altogether	16	Altogether	16	Altogether	20	Altogether	20	Altogether	17	Altogether	17

Source: Own based on FSAS(2009) dataset

Note: Ranking with respect to 49 products.

Table 5: Change in expenditure per 100g by lifestage and CAMEO category
(with respect to the healthiest choice)

Expenditure	Lifestage group					CAMEO group										Altogether
order	Group 1	Group 2	Group 3	Group 4	Group 5	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	
1th	-6.9	16.2	16.2	-6.9	3.5	-24.6	16.2	16.2	-6.9	16.2	16.2	-6.9	16.2	-24.6	-11.6	16.2
2nd	16.2	-6.9	60.9	16.2	16.2	-11.6	-6.9	60.9	16.2	-6.9	-6.9	16.2	3.5	-11.6	16.2	-6.9
3rd	60.9	-11.6	3.3	60.9	-6.9	16.2	-11.6	-6.9	-0.8	60.9	60.9	60.9	-11.6	16.2	-24.6	60.9
4th	-11.6	60.9	59.7	-11.6	-24.6	-11.6	-24.6	3.5	-11.6	-4.9	-4.9	-11.6	-24.6	-11.6	-11.6	3.5
5th	-4.9	-24.6	-4.9	3.5	60.9	-11.6	60.9	-24.6	-11.6	69.4	3.5	-24.6	60.9	-11.6	-6.9	-11.6
6th	-24.6	3.5	-11.6	-24.6	-11.6	-6.9	3.5	-11.6	-24.6	59.7	69.4	-11.6	-6.9	3.5	-11.6	-24.6
7th	3.5	-4.9	-24.6	-11.6	59.7	3.5	3.3	3.3	60.9	3.3	59.7	-27.0	3.3	-11.6	-0.8	3.3
8th	3.3	3.3	69.4	-11.6	3.3	60.9	-11.6	-4.9	-11.6	3.5	3.3	3.3	-4.9	3.3	60.9	-4.9
9th	69.4	69.4	-6.9	-4.9	-4.9	-11.6	-4.9	-11.6	-55.8	-11.6	-11.6	15.1	-11.6	-6.9	3.3	59.7
10th	59.7	-11.6	-11.6	-0.8	-56.9	3.3	59.7	-11.6	3.5	84.7	-24.6	3.5	-11.6	60.9	-20.4	69.4

Source: Own based on FSAS(2009) dataset

Table 6: Change in expenditure per 100g by lifestage and CAMEO category
(with respect to the choice with the second least fat)

Expenditure	Lifestage group					CAMEO group										Altogether
order	Group 1	Group 2	Group 3	Group 4	Group 5	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	
1th	-24.0	-5.1	-5.1	-24.0	-15.5	-38.5	-5.1	-5.1	-24.0	-5.1	-5.1	-24.0	-5.1	-38.5	-27.8	-5.1
2nd	-5.1	-24.0	31.4	-5.1	-5.1	-27.8	-24.0	31.4	-5.1	-24.0	-24.0	-5.1	-15.5	-27.8	-5.1	-24.0
3rd	31.4	-27.8	-15.6	31.4	-24.0	-5.1	-27.8	-24.0	-19.0	31.4	31.4	31.4	-27.8	-5.1	-38.5	31.4
4th	-27.8	31.4	30.4	-27.8	-38.5	-27.8	-38.5	-15.5	-27.8	-22.4	-22.4	-27.8	-38.5	-27.8	-27.8	-15.5
5th	-22.4	-38.5	-22.4	-15.5	31.4	-27.8	31.4	-38.5	-27.8	38.3	-15.5	-38.5	31.4	-27.8	-24.0	-27.8
6th	-38.5	-15.5	-27.8	-38.5	-27.8	-24.0	-15.5	-27.8	-38.5	30.4	38.3	-27.8	-24.0	-15.5	-27.8	-38.5
7th	-15.5	-22.4	-38.5	-27.8	30.4	-15.5	-15.6	-15.6	31.4	-15.6	30.4	-40.4	-15.6	-27.8	-19.0	-15.6
8th	-15.6	-15.6	38.3	-27.8	-15.6	31.4	-27.8	-22.4	-27.8	-15.5	-15.6	-15.6	-22.4	-15.6	31.4	-22.4
9th	38.3	38.3	-24.0	-22.4	-22.4	-27.8	-22.4	-27.8	-63.9	-27.8	-27.8	-6.0	-27.8	-24.0	-15.6	30.4
10th	30.4	-27.8	-27.8	-19.0	-64.8	-15.6	30.4	-27.8	-15.5	50.8	-38.5	-15.5	-27.8	31.4	-35.0	38.3

Source: Own based on FSAS(2009) dataset

Table 7: Change in expenditure per 100g by lifestage and CAMEO category
(with respect to the choice with the second least sodium)

Expenditure	Lifestage group					CAMEO group										Altogether
order	Group 1	Group 2	Group 3	Group 4	Group 5	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	
1th	5.3	31.5	31.5	5.3	17.0	-14.8	31.5	31.5	5.3	31.5	31.5	5.3	31.5	-14.8	0.0	31.5
2nd	31.5	5.3	82.0	31.5	31.5	0.0	5.3	82.0	31.5	5.3	5.3	31.5	17.0	0.0	31.5	5.3
3rd	82.0	0.0	16.8	82.0	5.3	31.5	0.0	5.3	12.2	82.0	82.0	82.0	0.0	31.5	-14.8	82.0
4th	0.0	82.0	80.7	0.0	-14.8	0.0	-14.8	17.0	0.0	7.5	7.5	0.0	-14.8	0.0	0.0	17.0
5th	7.5	-14.8	7.5	17.0	82.0	0.0	82.0	-14.8	0.0	91.6	17.0	-14.8	82.0	0.0	5.3	0.0
6th	-14.8	17.0	0.0	-14.8	0.0	5.3	17.0	0.0	-14.8	80.7	91.6	0.0	5.3	17.0	0.0	-14.8
7th	17.0	7.5	-14.8	0.0	80.7	17.0	16.8	16.8	82.0	16.8	80.7	-17.4	16.8	0.0	12.2	16.8
8th	16.8	16.8	91.6	0.0	16.8	82.0	0.0	7.5	0.0	17.0	16.8	16.8	7.5	16.8	82.0	7.5
9th	91.6	91.6	5.3	7.5	7.5	0.0	7.5	0.0	-50.0	0.0	0.0	30.2	0.0	5.3	16.8	80.7
10th	80.7	0.0	0.0	12.2	-51.2	16.8	80.7	0.0	17.0	108.9	-14.8	17.0	0.0	82.0	-9.9	91.6

Source: Own based on FSAS(2009) dataset

If the replacement is done with respect to the sausage with the second least content of fat (see Table 6), then it would be possible for all the groups not only to improve their health choice but also save money as show by the first row of the table. A different way of reading this result is that the choice of sausage is not necessarily led by economic reasons as consumers could get healthier choices at a lower price. Certainly other reasons might influence the decisions such as the palatability of the sausage.

The analysis with respect to the second sausage in terms of sodium content show results that dramatically different than the ones with respect to fat. Thus, the table shows that most of the groups would need to increase their expenditure in order to purchase such a sausage. Moreover, when all the groups are considered together the movement from the top sausage in terms of expenditure share to the second with the least content in terms of sodium would imply an increase in the expenditure by 31.5 per cent. If the price of healthier choices can be considered a barrier to improve consumers' choice, then to promote the consumption of sausages with less sodium would be a more difficult task to promote sausages with lower salt.

As regards the previous result, the conclusions from the study by Sheard et al. (2010) as regard British sausages are interesting. They state that no correlation was found between fat content and juiciness and between salt content and perceived saltiness. The lack of association between fat and juiciness seems to be due to the fact that the latter depends not only on the intramuscular fat content but also by the amount of moisture retained after cooking which itself depend on various factors: the moisture level of the uncooked sausage, the amount of added rusk, any added soya protein and the amount of added salt and phosphate. With respect to the low association between salt content and saltiness, they noted that the degree of perceived saltiness just not depend on the salt content per se but is also affected by the background composition of the product being assessed, including the level of fat, the lean content and the presence of monosodium glutamate (MSG).

The results Sheard et al. indicate that it possible for suppliers to improve the nutritional value of existing diet without changing much their palatability.

5. Conclusions

Overall, the purpose of the paper has been to analyse consumers' choices of sausages using supermarket data, and whether moving from sausages with high percentage of energy from saturated fats and high content of sodium per 100g to healthier ones would result in an increase of expenditure.

The results indicate that the top-ten consumers' choices are far from being the healthiest ones and there is plenty of scope for improvement. It is important to note that not in all the cases it is possible to replace the currently consumed sausage for a healthier version (i.e., lower saturated fat or lower sodium content) for the same price per 100g. However, this is possible in many cases, especially in the case of sausages with high fat content.

In the case of salt the results indicates that movements towards sausages with low sodium content would in several of the cases increase the expenditure. However, this is

a case where science can give a hand by modifying the composition of the products without changing much its taste. Thus, one of the solutions (besides educational campaigns directed to consumers) would be to improve the nutritional value of existing diet is decrease of fat and salt content in the processed meat.

Finally, there is a consensus amongst nutritionists and meat scientists alike, that higher quality, lean and low fat meat products should be preferred and higher fat content products such as regular sausages should be consumed in moderation (Valsta et al. 2005, Daviglus, A. Pirzada op. cit., MacAfee et al. 2010). Furthermore, higher quality of meat products and especially sausage could then significantly contribute to better diet of consumers who very often are not prepared to avoid or even decrease consumption of meat. Moreover meat can be a valuable part of human diet as it provides important nutrients such as essential amino acids, vitamins and minerals (Biesalski, 2005).

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