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Stead, Martine; MacKintosh, A. M.; M. Findlay, A.; Sparks, Leigh; Anderson, Annie; Barton, Kerry; Eadie, Douglas

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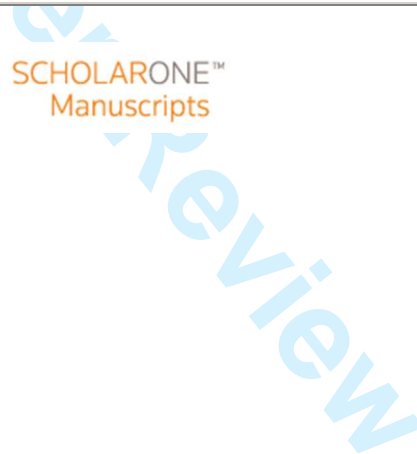
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**Impact of a targeted direct marketing price promotion intervention (Buywell) on food purchasing behaviour by low income consumers: a randomised controlled trial**

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1  
2 **1 Abstract**

3  
4 **2 Background**

5  
6 Price promotions are a promising intervention for encouraging healthier food purchasing. We  
7  
8 sought to assess the impact of a targeted direct marketing price promotion combined with healthy  
9  
10 eating advice and recipe suggestions on purchase of selected healthier foods by low income  
11  
12 consumers.

13 **7 Methodology**

14  
15 We conducted a randomised controlled trial (n=53,367) of a direct marketing price promotion  
16  
17 (Buywell) combined with healthy eating advice and recipe suggestions for low income consumers  
18  
19 identified as 'less healthy' shoppers. Impact was assessed using electronic point of sale data for UK  
20  
21 low income shoppers before, during and after the promotion.

22 **12 Results**

23  
24 The proportion of customers buying promoted products in the intervention month increased by  
25  
26 between 1.4% and 2.8% for four of the five products. When product switching was examined for  
27  
28 semi-skimmed/skimmed milk, a modest increase (1%) was found in the intervention month of  
29  
30 customers switching from full fat to low fat milk. This represented 8% of customers who previously  
31  
32 bought only full fat milk. Effects were generally not sustained after the promotion period.

33 **18 Principal conclusions**

34  
35 Short-term direct marketing price promotions combined with healthy eating advice and recipe  
36  
37 suggestions targeted at low income consumers are feasible and can have a modest impact on short  
38  
39 term food purchasing behaviour but further approaches are needed to help sustain these changes.  
40  
41  
42

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46 Anderson A.S., Barton K. & Eadie D. (2017) Impact of a targeted direct marketing price promotion  
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48 intervention (Buywell) on food-purchasing behaviour by low income consumers: a randomised controlled  
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60

## 23 Introduction

24 Diet is a major modifiable risk factor for many cancers<sup>(1)</sup> and circulatory diseases<sup>(2,3)</sup>. Obesity is a  
25 significant contributor to cardiovascular disease, diabetes and cancer, and continues to rise  
26 internationally<sup>(4)</sup> and in the UK<sup>(5)</sup>. Of particular concern are persistent inequalities in obesity, diet  
27 and health-related outcomes<sup>(6,7)</sup>. Low income consumers in the UK and other European countries  
28 tend to have *lower* intakes of fruit, vegetables, wholegrain bread and cereals, fruit juice and oil-rich  
29 fish, and *higher* intakes of sugar, whole milk and processed meats compared to higher income  
30 consumers<sup>(8-10)</sup>.

31 Increasingly, attention has focussed on system-level interventions which modify the social  
32 environment in which food choices are made<sup>(11-13)</sup> and make healthier choices easier<sup>(14)</sup>. Access  
33 and price have been identified as barriers to healthier eating for some low income consumers<sup>(15-19)</sup>,  
34 and the World Health Organization and various national governments have called for improved  
35 access to affordable healthy food for vulnerable groups<sup>(20-22)</sup>. If inequalities in diet are to be  
36 narrowed, it may be important to target prevention interventions primarily or specifically at these  
37 groups<sup>(23)</sup>.

38 Marketing in particular has been advocated as assisting in delivering a strategy for dietary  
39 improvement<sup>(12,21)</sup>. Recent UK government strategy<sup>(21,24-25)</sup> has recommended harnessing  
40 marketing techniques such as product development, labelling and pricing in support of ‘behaviour  
41 that builds health’, and working with retail businesses which have the marketing expertise to  
42 influence purchasing habits. Various studies suggest that interventions in the supermarket setting  
43 using point-of-sale promotions, pricing, in-store signposting and product labelling, singly or in  
44 combination, are feasible to implement and have the potential to impact on customer purchasing  
45 behaviour<sup>(26-29)</sup>.

46 Recent debate has focussed on financial incentives as a motivator to initiate change in health  
47 behaviours<sup>(11,30-32)</sup>, although this approach has not yet been demonstrated to produce consistently  
48 positive results in diet-related behaviours such as weight loss<sup>(33)</sup>. Financial incentives comprise  
49 food price promotions, subsidies, and rewards, and a recent review found that “*retail price  
50 promotions can influence purchasing patterns and promote overall greater consumption of the  
51 product, but this is highly dependent on the nature of the promotion (e.g. the depth of the discount,  
52 the shopper, and the specific food*” (p10)<sup>(34)</sup>. Recent studies in New Zealand and the Netherlands  
53 have demonstrated, using randomised controlled trial (RCT) methods, that price discounts for

1  
2 54 healthier foods can have a significant and sustained effect on food purchasing<sup>(35)</sup> and on fruit and  
3 55 vegetable purchases<sup>(36)</sup>. Although effects tend to be smaller than those obtained in more intensive  
4  
5 56 interventions<sup>(37)</sup>, marketing interventions potentially have a much wider reach and are relatively  
6  
7 57 cost-effective<sup>(38)</sup>.

8  
9 58 Price promotions have been extensively applied and studied in retailing<sup>(39)</sup>. Technological  
10  
11 59 developments have given rise to new and more targeted strategies, such as using data linked to  
12  
13 60 loyalty schemes<sup>(40,41)</sup> and customers' history of purchasing to develop promotions targeted at  
14  
15 61 individual customers<sup>(42)</sup>. Likewise, technology such as electronic point of sales (EPOS) systems  
16  
17 62 offers a unique opportunity for assessing household food purchases which do not rely on  
18  
19 63 participants' memory or literacy, is not subject to recall or social bias, and places no direct burden  
20  
21 64 on participants<sup>(43,44)</sup>. The ability to develop and deliver promotions targeted at groups of customers  
22  
23 65 on the basis of previous purchasing behaviour and other characteristics makes this a particularly  
24  
25 66 promising, although underexplored, route for addressing health inequalities associated with food  
26  
27 67 purchasing behaviour.

28  
29 68 This study sought to assess the feasibility and impact of a targeted direct marketing price promotion  
30  
31 69 intervention (Buywell) on food purchases by low income customers known not to be purchasing  
32  
33 70 'healthy' products at the time of the intervention.

## 34 71 **Methods**

### 35 72 **Overview**

36  
37 73 The intervention comprised a direct marketing (i.e. mailed out to customers' homes) price  
38  
39 74 promotion combined with healthy eating advice and recipe suggestions. Working with a major UK  
40  
41 75 food retailing group, we developed a price-based promotion combined with healthy eating advice  
42  
43 76 and recipe suggestions for selected healthier products which was mailed to regular low income  
44  
45 77 customers in May 2007. The impact was assessed by examining data on actual food purchases,  
46  
47 78 using EPOS technology, for intervention (37,034) and control group (16,333) customers for two  
48  
49 79 months before, one month during and three months after the intervention. A consumer survey was  
50  
51 80 also conducted post-intervention with 3,706 customers; a brief summary of findings is reported  
52  
53 81 elsewhere<sup>(45)</sup>. Ethical approval for the study was provided by University of Stirling Research  
54  
55 82 Ethics Committee.

### 83 Identification, selection and randomisation of sample

84 Information held by the retailer from membership card data and linked EPOS transaction data was  
85 used to identify and select the study sample. The first step was to identify consumers who used the  
86 retailer for their main food shopping, defined by possession of a loyalty/membership card,  
87 proximity to a store in a town with few other major food retailers, and being categorised as in either  
88 of the top two customer spending categories, based on frequency of shopping and average number  
89 of items purchased per month.

90 The second step was to identify low income customers. Membership data held by the retail group  
91 did not record individual income or socio-economic status. However, based on their postcode and  
92 other data, all customers were assigned to a category within MosaicUK, a widely used geo-  
93 demographic classification scheme<sup>(46)</sup>. Three Mosaic categories including primarily disadvantaged  
94 customers were identified as the core target for the intervention.

95 The final step was to identify consumers whose current food purchasing behaviour had the potential  
96 to be shifted in a 'healthier' direction. The most practicable strategy was to identify those who  
97 could currently be defined as purchasers of 'healthier' foods and exclude them from the sample. All  
98 food product categories stocked by the retail group were examined, and 90 were identified which  
99 were low in fat, sugar and sodium according to the UK Food Standards Agency 'traffic lights'  
100 scheme<sup>(47)</sup>. From these, 20 of the most commonly purchased product categories were identified to  
101 serve as indicators of 'healthier' shopping. The indicators were based on the 35 item healthy eating  
102 indicator shopping basket tool (HEISB)<sup>(48)</sup>. These included low fat dairy products (milk, yoghurt,  
103 spreading fats) and wholegrain products (brown and wholemeal breads, wholegrain breakfast  
104 cereals, wholegrain rice and pasta, beans and peas). Fresh vegetables and fruits (n=15) included in  
105 the HEISB were not used because formative work indicated they were not a reliable indicator of  
106 purchasing patterns from the retail group because these items were occasionally bought elsewhere  
107 (e.g. produce markets). Healthier' purchasers were arbitrarily defined as those who had bought a  
108 wide selection of these items, defined as at least 8 (40%), of the healthy eating indicator foods  
109 within the last week, and these were removed from the sample.

110 The retail group applied the three criteria of regular food shopping, low income Mosaic group and  
111 less-healthy purchasing to its customer database for the time period immediately prior to the  
112 intervention. This yielded a sample group of 53,367 adults aged 31-65 which was then randomised  
113 by the retail group on a 70:30 allocation ratio to intervention (n=37,034) or control group

1  
2 114 (n=16,333). The rationale was to reach as large a customer group as the retail group could afford  
3 115 (the costs of price promotions being borne by the retailer in reduced profits), whilst ensuring a  
4  
5 116 sufficiently large control group.  
6

### 7 117 **The intervention**

8  
9 118 Formative focus group research (six focus groups, n=34) was conducted with a sample of target  
10 119 group consumers to inform the intervention design. Findings suggested that older and female  
11  
12 120 shoppers were more likely to use price promotions, and that although customers were fairly  
13  
14 121 conservative in their shopping habits, they felt their meals sometimes lacked variety. This suggested  
15 122 that there was potential for a promotion comprising offers on basic food products which could be  
16 123 combined to make a meal, especially if linked to recipe ideas and if separate coupons were provided  
17  
18 124 to maximise choice and minimise waste. Informed by this research, a direct mail promotion was  
19  
20 125 developed incorporating healthy eating advice and two suggested recipes which were analysed for  
21 126 nutritional content and piloted by nutritionists. The final promotion contained two separate offers,  
22  
23 127 both branded with the caption 'Healthy eating made easier' and accompanied by general healthy  
24 128 eating advice. The five products on which price promotions were offered were low fat beef mince,  
25  
26 129 skinless chicken, any fresh vegetables, ready-to-eat sauce (two different flavours, both assessed as  
27  
28 130 meeting health criteria), and skimmed/semi-skimmed milk (Figure 1).

29  
30 131 The promotion was mailed from 7<sup>th</sup>-28<sup>th</sup> May, 2007. The time of the year was chosen to avoid other  
31  
32 132 key periods of promotional activity such as Christmas and Easter.  
33

### 34 133 **EPOS data analysis**

35  
36 134 The primary outcome of the study was the purchase of the promoted products, using EPOS data.  
37  
38 135 The outcome measures of interest were uptake of the promotion for each of the promotion products  
39 136 and product switching. Anonymised EPOS data were supplied from March to August (with May as  
40  
41 137 the promotion month) by the retailer by transaction. Recorded purchases of the promoted products  
42  
43 138 were the primary outcome measure. Data were aggregated by customer membership card number to  
44 139 give customer-based data and 'basket' combination data which were compared from month to  
45  
46 140 month. EPOS data are classified by a sequence of main and sub-categories, with every individual  
47  
48 141 product of a given size having a unique code. There were more than 150,000 products on the  
49  
50 142 retailer's product list, although this included non-food items and items not currently on sale. Codes  
51  
52 143 were obtained for the promotion products and entered to identify purchase of these products.  
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1  
2 144 Uptake of the promoted products was analysed in terms of the number and proportion of customers  
3 145 buying each of the products, compared with the control group. Chi-square tests were used to test  
4 146 whether uptake of products, by the intervention group in the promotion month, could have occurred  
5 147 by chance. Two tests were conducted for all promotion products. Firstly, differences between  
6 148 control and intervention groups were tested. Secondly, differences were examined between  
7 149 transactions in the promotion month (May) and the average uptake for each product for the months  
8 150 excluding the promotion. This accounts for seasonal variation in uptake of products.  
9

10  
11 151 Product switching is an important part of the uptake of any promotion<sup>(49)</sup> and can have different  
12 152 dimensions: health switching (e.g. from full fat to semi-skimmed milk), brand switching (e.g. from  
13 153 a branded product to retailer brand), and pack size switching (from the size usually bought to the  
14 154 size included in the offer). In public health terms, only the first form of switching, from a less to  
15 155 more healthy variant, is meaningful<sup>(50)</sup>. Within this paper, information on switching is presented for  
16 156 milk, where less healthy variants could be clearly identified within the data. Because of the way  
17 157 products were categorised by the retailer in the EPOS data, it was more difficult to identify less  
18 158 healthy variants for the meat products included in the promotion.  
19

## 20 159 **Results**

21 160 Over 4 million transactions per month were recorded on the retailer-supplied database. Nearly all  
22 161 (99.6%) of the study group made purchases with the retail group at the start of the study, falling  
23 162 slightly to 92.6% still making purchases with the retail group by the end of the six month study  
24 163 period. The mean number of items purchased per customer over the study period ranged between 83  
25 164 and 92 (Table 1).  
26

## 27 165 **Uptake**

28 166 Figure 2 illustrates uptake of the promoted products by both groups over the study period. There  
29 167 was wide variation in the proportions regularly buying each product. Whilst over 60% bought  
30 168 vegetables, the other four products were less commonly purchased. For example, only around 40%  
31 169 regularly bought skinless chicken and fewer than 5% bought ready-to-eat sauce. For four of the five  
32 170 promoted products, there was a small upward spike, ranging from 1.4% to 2.8%, in the proportion  
33 171 of intervention customers purchasing the product in May, the intervention month (Figure 2A): semi-  
34 172 skimmed/skimmed milk (33.2% to 34.6%), lean steak mince (9.7% to 12.5%), skinless chicken  
35 173 breasts (6.3% to 8.2%), and ready-to-eat sauce (1.4% to 2.8%). Figure 2B illustrates that the  
36 174 proportion of control customers purchasing each of the five promoted products remained consistent  
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1 175 in the month of the intervention, reflecting the constancy of purchasing patterns for most shoppers.  
2  
3 176 Vegetable purchases increased by only 0.2% among intervention customers in May, but decreased  
4  
5 177 by 0.8% among control group customers; following the promotion, vegetable purchases decreased  
6  
7 178 in both the intervention and the control group, perhaps reflecting seasonality. For each of the five  
8  
9 179 products, the promotion month showed a significantly higher ( $p < 0.001$ ) value, for the intervention  
10  
11 180 group, than would have been expected on the basis of average uptake in the other months.  
12  
13 181 Similarly, when compared with the control sample, the promotion values for each of the products  
14  
15 182 were significantly higher ( $p < 0.001$ ) than expected values. The exception was skimmed and semi-  
16  
17 183 skimmed milk, significant at  $p < 0.05$ . No significant difference was found between the control and  
18  
19 184 intervention groups for the other months. The increase in the proportion of intervention customers  
20  
21 185 purchasing four of the promoted products was generally not sustained beyond the intervention, with  
22  
23 186 the number of customers purchasing each product reverting to pre-intervention levels or lower from  
24  
25 187 June onwards, again perhaps reflecting seasonal patterns in purchasing.

26 188 Further analyses were conducted to explore whether the promotion widened the customer base for  
27  
28 189 the promoted products, as the data above suggest, or simply encouraged existing customers for the  
29  
30 190 products to buy more than usual. Analysis of the mean number of promoted products purchased per  
31  
32 191 customer each month indicated that this did not tend to vary over the study period (for example, the  
33  
34 192 mean number of low fat beef mince items bought per customer was between 1.28 and 1.30 per  
35  
36 193 month, including May). This suggests that the increase in uptake was explained primarily by a  
37  
38 194 widening of the customer base – i.e. introducing new customers to the promoted products – rather  
39  
40 195 than by existing customers buying more of a product than they would usually. Overall, the data  
41  
42 196 indicate that the intervention month was associated with an increase in the customer base for most  
43  
44 197 of the promoted products.

### 45 198 **Product switching**

46 199 Table 2 profiles the intervention customers, who purchased the promoted milk in May, in terms of  
47  
48 200 continuing customers, new customers and customers who switched brand or switched to lower fat  
49  
50 201 milk. Pack-size switching was not relevant because the promotion was not restricted to specific  
51  
52 202 pack sizes. One third ( $n=12,399$ , 33%) of all intervention customers bought the promoted  
53  
54 203 skimmed/semi-skimmed retailer brand milk during the promotion period. Most of these ( $n=10,072$ ,  
55  
56 204 81%) were continuing customers who had purchased skimmed/semi-skimmed retailer brand milk in  
57  
58 205 the month prior to the intervention, while almost a fifth ( $n=2,327$ , 19%) were customers who had  
59  
60 206 switched from buying full fat only, switched from a different brand or were new to purchasing milk

207 at the retail group. As a proportion of all intervention customers, the numbers taking up the  
208 promoted milk, either as a result of switching or new purchases, appear small, representing 1%  
209 (n=464) switching to healthier milk, 1% (n=262) switching brand and 4% (n=1,601) new  
210 customers. However, from a health perspective, the key target group for the milk promotion is  
211 customers who previously purchased only the full fat variety of milk. The EPOS analysis showed  
212 that 6,034 intervention customers purchased only the full fat milk in April i.e. before the  
213 intervention. Therefore, the 464 customers who switched to a healthier variety of milk during the  
214 intervention month represent 8% of the target group.

215 Table 3 shows that only 36% (n=169) of those who had switched to a healthier variety of milk  
216 continued to purchase the skimmed/semi-skimmed variety in the month immediately after the  
217 promotion ended. Retention of the healthier purchase behaviour continued to decline in subsequent  
218 months. Only 17% (n=81) of those who switched to the healthier milk sustained their healthier milk  
219 purchasing in each of the three months after the promotion completed; these customers represent  
220 1% of the target group of 6,034 intervention customers who had purchased only full-fat milk in  
221 April prior to the intervention. Retention declined similarly among those who switched brand of  
222 milk and among new customers, with 23% (n=61) of brand switchers and 22% (n=348) of new  
223 customers continuing to purchase the skimmed/semi-skimmed retailer brand milk in each of the  
224 three months after the promotion.

## 225 Discussion

226 This large randomised trial shows that it is feasible to develop and implement a direct marketing  
227 price promotion intervention targeted at low income consumers not currently buying healthy food.  
228 Customers who lived in disadvantaged postcode areas and with less 'healthy' current food  
229 purchasing patterns were able to be identified by matching EPOS data and customer membership  
230 data. These customers were then targeted with price promotion offers, combined with healthy eating  
231 advice and recipe suggestions, informed by consumer research insights into their shopping habits  
232 and preferences. If nutrition interventions are to have an impact on dietary inequalities, more  
233 intensive and targeted efforts directed at those most in need of support are required. Technological  
234 innovations and the development of sophisticated marketing databases provide a means not only of  
235 identifying the customers most in need of support but also of developing, delivering and evaluating  
236 interventions specifically for them.

237 Two key findings emerge from our results. Firstly, there appears to have been a modest and short-  
238 lived impact of the intervention on uptake of the promoted products, with the increase in  
239 intervention customers buying products in the intervention month ranging from 1.4% to 2.8% for  
240 four of the five products. Increased uptake was accounted for primarily by a widening of the  
241 customer base rather than by an increased number of purchases by existing customers. If the  
242 intervention had only encouraged additional purchasing of the promoted items by customers who  
243 already bought them, the contribution to influencing purchasing behaviour in a healthier direction  
244 would have been of less significance.

245 Secondly, the intervention appears to have been associated with a small increase in health switching  
246 for milk. This increase in lower fat milk was modest, 1% of all intervention customers. However,  
247 among the key target group for the milk promotion from a health perspective, 8% switched to a  
248 healthier variant of milk in the intervention month, suggesting that price promotions can encourage  
249 trial of healthy variants. This is an important target food given the higher consumption of full fat  
250 milk by low income groups<sup>(51)</sup>. Switching tended to be short-lived, with only 36% continuing to do  
251 so immediately after the promotion ended, and only 17% sustaining their healthier milk purchasing  
252 in each of the three months after the promotion completed (1% of the target group). Studies of price  
253 promotions in the retail literature confirm that effects are typically short-lived<sup>(52)</sup>.

254 One of the main strengths of the study was its size, over 50,000 low income customers across the  
255 UK. The large sample and geographical spread mean that the results are potentially generalisable to  
256 the wider UK low income population, although not necessarily to more affluent UK populations or  
257 to low income shoppers in other countries. The commitment and support of the retail group enabled  
258 the research team to access large numbers of customers and to profile them in terms of postcode  
259 level of disadvantage and food purchasing behaviour, enabling those most 'at risk' to be identified  
260 for participation in the intervention. The retail group also allowed the research team direct access to  
261 the EPOS data, rather than, as is the case in some studies, having the research team dependent on  
262 the retailer or a third party to conduct the analysis.

263 Analysing the EPOS dataset was challenging because of the vast amount of data generated and  
264 because products were not necessarily categorised within the database on the basis of nutrition  
265 attributes but according to criteria such as shelf order, making it time-consuming to locate all  
266 products of interest for analysis. Another challenge was that the price promotion covered several  
267 product categories spread across the retail outlet. While price promotion effects have been  
268 extensively studied in the retail literature, the challenge of a promotion such as the current one

1 269 which links products placed at different locations of the store has been less well researched.  
2  
3 270 Findings from disparate studies suggest that product categorisation is important in shaping the  
4  
5 271 likelihood of healthy food purchasing (<sup>53</sup>) and that location of the products in their correct categories  
6  
7 272 promotes greater likelihood of purchase (<sup>54</sup>).  
8

9 273 Since the survey was carried out, considerable expertise and familiarity with 'Big Data' has been  
10  
11 274 gained and its usefulness much more widely recognised. Using loyalty card data linked to EPOS  
12  
13 275 transactions requires customers to remember to use their identifier each time they buy in the store.  
14  
15 276 However, as noted in the Introduction, EPOS analysis has a number of advantages for evaluation  
16  
17 277 purposes in that it is not subject to recall or social bias and places no direct burden on participants  
18  
19 278 (<sup>43, 44</sup>). This makes it a particularly useful method for evaluating outcomes among obese  
20  
21 279 populations, among whom there is a particular problem of giving socially desirable responses in  
22  
23 280 dietary research (<sup>55, 56</sup>), and among populations with varying levels of literacy (<sup>43</sup>). Given the  
24  
25 281 complexity and cost of conducting large-scale dietary and consumer behaviour surveys, EPOS data  
26  
27 282 analysis provides a cost-effective means of evaluating population-level interventions and policies  
28  
29 283 (<sup>44</sup>).  
30

31 284 Purchase behaviour does not necessarily reflect actual dietary intake; we do not know the extent to  
32  
33 285 which individuals in a household consumed the purchased products. However, Eyles and colleagues  
34  
35 286 (<sup>43</sup>) found that, when electronic sales data were compared with repeated 24-hour dietary intake  
36  
37 287 recalls, modest correlations were observed between household purchases and individual intakes for  
38  
39 288 percentage energy from saturated and total fat, carbohydrate, protein and sugar, and that purchase  
40  
41 289 data were a reasonably reliable surrogate measure for certain nutrient intakes. In other words, sales  
42  
43 290 data can serve as a useful proxy for dietary impact. The type of effect found in the Buywell study, if  
44  
45 291 enlarged to a wider product range (for example, main sources of saturated fat), could make an  
46  
47 292 important contribution to changes in disease risk. Current modelling data at population level suggest  
48  
49 293 that even modest changes in diet are important. For example, Flores-Mateo and colleagues (<sup>57</sup>)  
50  
51 294 suggest that reducing salt consumption by one g/day, reducing saturated fat and trans fat by 1% and  
52  
53 295 0.5% of energy intake respectively, and increasing fruit and vegetable intake by one portion per day  
54  
55 296 could result in approximately 13,850 fewer UK CVD deaths per year, while it has been estimated  
56  
57 297 that reducing dietary salt intake by 3g per day would prevent 30,000 cardiovascular events with  
58  
59 298 savings worth at least £40 million a year in the UK (<sup>58</sup>).  
60

299 The positive changes in food purchasing behaviour reported here are generally modest in scale.  
300 That the impact was restricted to the intervention period was not surprising; it might have been

1 301 expected that sustained changes in purchasing behaviour could not be achieved with such a short  
2  
3 302 intervention, and the short-lived impact is in line with effects reported in retailing studies (<sup>52</sup>).  
4  
5 303 However, it is encouraging that a short-term and relatively small-scale promotion – a one-off price  
6  
7 304 promotion combined with healthy eating advice and recipe suggestions - was nonetheless able to  
8  
9 305 trigger changes in purchasing behaviour in a small proportion of the target group. This suggests that  
10  
11 306 a longer-term and more multi-faceted intervention may be capable of producing more lasting  
12  
13 307 effects. Hawkes (<sup>34</sup>) suggests that healthy eating interventions based on financial incentives may be  
14  
15 308 most effective when implemented as part of a wider and integrated package of mutually-reinforcing  
16  
17 309 activities rather than in isolation. A review of financial incentives in the USA noted that financial  
18  
19 310 incentives might be more effective when combined with nutrition education (as the current study  
20  
21 311 has done, although the information/education element was limited in our study to brief messages  
22  
23 312 about the value of calcium to teeth and bone development and guidance regarding young children  
24  
25 313 and milk consumption), and also with components to address access (<sup>59</sup>).

26 314 Overall, the study demonstrates that it is possible for public health researchers and nutritionists to  
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28 315 engage with food retailers to develop and implement healthy eating interventions in real world  
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30 316 settings. We have shown that a direct marketing intervention targeted at individual consumers on  
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32 317 the basis of past purchasing behaviour and other characteristics can have a short-term and modest  
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34 318 impact on uptake of healthier food products. We have also shown that it is possible to engage with  
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36 319 and stimulate change, albeit of short duration, among low-income consumers experiencing dietary  
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38 320 inequalities. Effects of such interventions may be sustained and/or reinforced by longer-term and  
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40 321 more multi-faceted approaches.

322

### 41 323 **List of abbreviations**

42 324 RCT - randomised controlled trial

43 325 EPOS - electronic point of sale

44 326 HEISB - healthy eating indicator shopping basket tool

327

### 49 328 **Transparency Declaration**

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51 329 The lead author affirms that this manuscript is an honest, accurate, and transparent account of the  
52  
53 330 study being reported, that no important aspects of the study have been omitted and that any  
54  
55 331 discrepancies from the study as planned (and registered with) have been explained. The reporting of  
56  
57 332 this work is compliant with CONSORT1/STROBE2/PRISMA3 guidelines.

1  
2 333 **Competing Interests**

3  
4 334 All authors declare that they have no competing interests.

5  
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26  
27 346 execution or decision to publish this trial.

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29 347 **Figure Legends:**

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31 348 Figure 1 Content of the promotion

32  
33 349 Figure 2 Changes in proportions of customers buying the promoted products

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2 503 **Figures**  
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For Peer Review

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507 **Tables**

508 Customers who switched to the promoted milk or were new to the promoted milk in May.

For Peer Review

**Table 1: Number of transactions and customers**

Month	Transactions n=	Intervention Customers n=	Control Customers n=	Total Customers n=	Total customers as % of original study sample	Items purchased per customer Mean
<b>2007</b>						
<i>Base:</i>		(37,034)	(16,333)	(53,367)	(53,367)	
March	4,908,066	36924	16232	53156	99.6%	92.33
April	4,397,790	36464	16090	52554	98.4%	83.68
May	4,511,999	35835	15783	51618	96.7%	87.41
June	4,379,735	35377	15648	51025	95.6%	85.84
July	4,255,832	35077	15532	50609	94.8%	84.09
August	4,116,864	34249	15178	49427	92.6%	83.29

Table 2: Profile of intervention customers who purchased promoted milk in intervention month

	Intervention customers n=	(a) % of all intervention customers	(b) % of all intervention customers who purchased the promoted milk in May
<i>Base:</i>		(37,034)	(12,399)
Purchased skimmed/semi-skimmed retailer brand milk in May	12,399	33%	100%
• Continuing customers – purchased before and during promotion	10,072	27%	81%
• Switched from full fat only:	464	1%	4%
- bought skimmed/semi-skimmed AND full fat)	367	1%	3%
- bought skimmed/semi-skimmed only	97	0.3%	1%
• Switched brand	262	1%	2%
• New customers (did not buy any milk from this retail group in April, i.e. pre-intervention)	1601	4%	13%



**Table 3: Retention of milk switchers and new customers in the 3 months post-promotion, intervention customers**

	(a) Switchers: Full fat only to skimmed/semi		(b) Switchers: Brand		(c) New customers		Total	
<i>Base:</i>	(464)		(262)		(1601)		(2327)	
Retained in:								
June	169	(36%)	136	(52%)	778	(49%)	1,083	(47%)
June and July	102	(22%)	96	(37%)	502	(31%)	700	(30%)
June, July and August	81	(17%)	61	(23%)	348	(22%)	490	(21%)
Base: intervention								

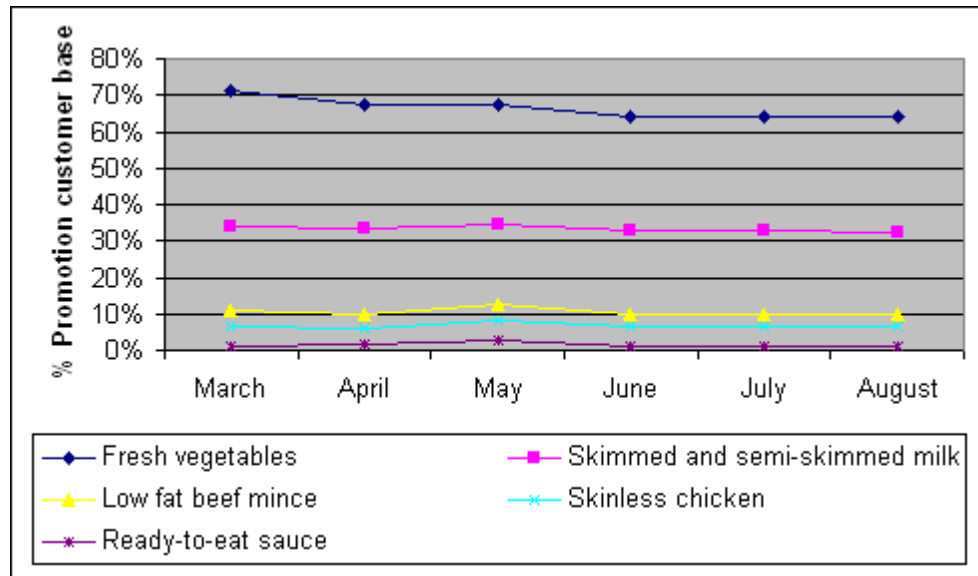
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**Figure 1 Content of the promotion**Healthy Meal Deal

Aimed to encourage a switch to healthier meals through price reductions on the main ingredients of healthy meals based on low fat beef mince and skinless chicken. Each deal included two attractive simple recipes featuring the promoted ingredients, and three discount coupons worth £2.50 (€2.90) for retailer brand low fat beef mince and skinless chicken breasts, any fresh vegetable, and a retailer brand ready-to-eat sauce which met health criteria (including sodium levels).

Low Fat Milk Repeat Purchase Offer

Comprised six money-off coupons for retailer brand skimmed and semi-skimmed milk (2 and 4 pint). Usage was restricted to one coupon per visit to encourage repeat purchase. The promotion included messages about the value of calcium to teeth and bone development and guidance regarding young children and milk consumption.

**Figure 2: Changes in proportions of customers buying the promoted products****A: Intervention customers****B: Control customers**