



# University of Chester



This work has been submitted to ChesterRep – the University of Chester's  
online research repository

<http://chesterrep.openrepository.com>

Author(s): Zehra Buyuktuncer ; Matt Kearney ; Christine Louise Ryan ; Miranda  
Thurston ; Basma Ellahi

Title: Fruit and vegetables on prescription: A brief intervention in primary care

Date: 2014

Originally published in: Journal of Human Nutrition and Dietetics

Example citation: Buyuktuncer, Z., Kearney, M., Ryan, C. L., Thurston, M., & Ellahi,  
B. (2014). Fruit and vegetables on prescription: A brief intervention in primary care,  
*Journal of Human Nutrition and Dietetics, supplement 2*, 186-193. [http://dx.doi.org/  
10.1111/jhn.12109](http://dx.doi.org/10.1111/jhn.12109)

Version of item: Peer reviewed version

Available at: <http://hdl.handle.net/10034/336734>

1 **Title:** Fruit and vegetables on prescription: a brief intervention in primary care  
2  
3 **Authors:** Zehra Buyuktuncer, Matt Kearney, Christine Louise Ryan, MirandaThurston,  
4 Basma Ellahi  
5  
6  
7 Dr Zehra Buyuktuncer  
8 1. Department of Clinical Sciences, Faculty of Applied Sciences, University of Chester,  
9 Chester, UK  
10 2. Department of Nutrition and Dietetics, Faculty of Health Sciences, Hacettepe  
11 University, Ankara, Turkey  
12  
13 Dr Matt Kearney  
14 Department of Health, Wellington House, London, UK  
15  
16 Christine Louise Ryan  
17 Department of Clinical Sciences, Faculty of Applied Sciences, University of Chester,  
18 Chester, UK  
19  
20 Prof MirandaThurston  
21 1. Center for Public Research, University of Chester, Chester UK  
22 2. Faculty of Public Health Sciences, Hedmark University College, Elverum, Norway  
23  
24  
25 **Corresponding author:**  
26 Dr Basma Ellahi, Faculty of Health and Social Care, University of Chester, CH14BJ, UK  
27

28 **Abstract**

29 **Background** Increasing fruit and vegetable consumption is a goal for the UK. Therefore, the  
30 effectiveness of a fruit and vegetable voucher scheme coupled with key ‘5-a-day’  
31 consumption messages as a brief intervention in primary care consultations was assessed in  
32 this study.

33 **Methods** 1188 vouchers as a prescription for fruits and vegetables were routinely distributed  
34 to patients attending a primary health care centre in a deprived area, and 124 volunteer  
35 patients routinely attending the centre were included. Telephone based questionnaires were  
36 used to examine changes in consumption in the short and medium term. Other key aspects  
37 assessed in the evaluation related to fruit and vegetable purchasing behaviour, knowledge  
38 relating to what constitutes a portion size, the relationship between food and health, and  
39 barriers to consumption.

40 **Results** Although 76.2% of participants used the prescription vouchers when purchasing  
41 fruits and vegetables, a significant change in the consumption or purchasing behaviour was  
42 not observed ( $p>0.05$ ). Participants’ level of knowledge relating to number of portions  
43 recommended and the portion size of different fruits and vegetables showed moderate  
44 increase from baseline to short term and to medium term. The primary barriers to fruit and  
45 vegetable consumption were reported as ‘the quality of fresh fruits and vegetables’ and ‘the  
46 money available to spend on food’.

47 **Conclusion** The use of “the fruit and vegetable on prescription” scheme was an effective  
48 method of engaging participants in improving awareness of key diet related health messages.  
49 However, further intervention is required to produce a significant impact on the actual  
50 behaviour change.

51

52 **Keywords** fruit and vegetable prescription, mainstreaming prevention, health settings

53

54

## 55 **Introduction**

56

57 The World Health Organisation (WHO) recommends a daily intake of 400 g of fruit and  
58 vegetables a day (WHO, 2009). The United Kingdom (UK) differs from most other countries  
59 in Europe in translating this recommendation into five *portions* of fruit and vegetables per  
60 day. Although a global proposal to increase fruit and vegetable intake was launched, the  
61 minimum intake of fruit and vegetables has still not been achieved by many populations  
62 (Casagrande *et al.*, 2007; Bates *et al.*, 2010). In the UK, the average fruit and vegetable intake  
63 has remained less than five portions per day: 234 g per day in men and 253 g per day in  
64 women (Bates *et al.*, 2010). Lower levels of consumption have been noted amongst younger  
65 adults, children and those on low incomes (Henderson *et al.*, 2002; Bates *et al.*, 2010).

66 It is known that an individual's likelihood of achieving '5-a-day' is affected by many  
67 factors such as socio-economic status, health status, nutritional knowledge, awareness of the  
68 health impacts of different foods, skills and confidence in buying, preparing and serving fruit  
69 and vegetables, as well as accessibility of shops selling good quality food (Kearney *et al.*,  
70 2005). Amongst all these factors, the socioeconomic gradient is accepted as one of the major  
71 determinants of health (WHO, 2002; Marmot, 2007), thus lower socio-economic groups are  
72 particularly likely to consume inadequate levels of fruit and vegetables (Department of  
73 Health, 2003). Research has also shown that determinants, such as gender, age and smoking  
74 may affect fruit and vegetable consumption. Being female, slightly older, non- or ex- smoker,  
75 married or living with someone, with a high education level, is correlated with higher fruit  
76 and vegetable consumption (Estaquio *et al.*, 2008; Pollard *et al.*, 2001; Pérez-Lizaur *et al.*,  
77 2008).

78 In the UK central and local government have had a specific focus on improving  
79 nutrition across all socioeconomic groups but particularly those in the most deprived groups.  
80 In 2004 the Government White Paper, *Choosing Health: Making healthier choices easier*  
81 (Department of Health, 2004), emphasised the need to mainstream health promotion and  
82 disease prevention by addressing risk factors such as poor diet, in particular low fruit and  
83 vegetable consumption. It also detailed the action required if public health work was to be  
84 embedded in the day-to-day work of health professionals and, promised funding for training  
85 and public health capacity building in primary care (Department of Health, 2004). However,  
86 despite the evidence base linking fruit and vegetable consumption with health, there is clearly  
87 a problem in bringing about behaviour change at a population level in the required direction  
88 (Guenther *et al.*, 2006; Bates *et al.*, 2010).

89           One approach to increasing the consumption of fruit and vegetables among those  
90 living in disadvantaged circumstances that has been developed in recent years is the use of  
91 financial incentives, for example, through providing vouchers that give access to free or  
92 discounted fruit and vegetables. Studies carried out in the United States of America (USA)  
93 and based on an experimental study design have shown that providing vouchers to low  
94 income groups can increase fruit and vegetable consumption (Herman *et al.*, 2006; Anderson  
95 *et al.*, 2001). Using a survey methodology, Kunkel *et al.* (2003) also showed that vouchers  
96 provided to low-income seniors for use at local farmers' markets in the USA, increased fruit  
97 and vegetable consumption. In Wales, Burr *et al.* (2007) showed that providing vouchers was  
98 a simple and effective method of increasing the intake of fruit juice amongst pregnant women  
99 in a deprived community. There is therefore some evidence to suggest that financial  
100 incentives might be an effective mechanism that could be integrated into a brief intervention  
101 delivered in a primary care setting.

102           The 'Reconnecting Food and Health in Castlefields' project was an example of a brief  
103 intervention deployed in primary care consultations to address fruit and vegetable  
104 consumption. It aimed to improve the amount of fresh fruit and vegetables consumed by  
105 Castlefields Health Centre patients through a sustained approach that involved the delivery of  
106 dietary advice, the provision of a prescription for fruit and vegetables coupled with key '5-a-  
107 day' messages and "Cook and Taste" sessions. The prescription also contained some '5-a-  
108 day' educational information. The scheme aimed to utilise routine primary care encounters to  
109 improve access to, and consumption of, fruit and vegetables, and increase food knowledge  
110 and skills (Kearney *et al.*, 2005).

111           This paper reports on the findings from an exploratory small-scale pilot study, which  
112 set out to test the feasibility of introducing the 'Reconnecting Food and Health in Castlefields'  
113 project (previously described by Kearney *et al.*, 2005) and evaluate its impact. Given that this  
114 type of brief intervention (a prescription for fruit and vegetables supported by key 5-a-day  
115 messages) had not previously been used in the primary care setting a small-scale pilot study  
116 was justified. It was hypothesised that a prescription scheme for fruit and vegetables in a  
117 primary health care setting 1) improves knowledge and awareness relating to key messages  
118 about food and health; and 2) increases fruit and vegetable purchasing behaviour and  
119 consumption in the short and medium time frame following intervention.

120

## 121 **Methods**

122

123 Castlefields ward experiences the greatest level of multiple deprivation across all the Halton  
124 wards (a local authority area in the North West of the United Kingdom). The ward suffers the  
125 lowest ranking for income, employment, health and education (National Neighbourhood  
126 Statistics, 2000). For these reasons, this area was chosen for the research setting. Patients who  
127 routinely accessed Castlefields Health Centre (the primary health care setting) between  
128 February-June 2005 comprised the study population. The prescriptions for fruit and  
129 vegetables were distributed by GPs, nurses, health visitors and midwives to all patients, aged  
130 over 16 years, attending regular clinics at the Castlefields Health Centre and who were  
131 mentally and physically able to use the prescription. Adults who were severely ill, in  
132 emergency situations, had severe mental illness or significant cognitive impairment and those  
133 whom the clinician deemed the intervention would be inappropriate, were excluded. All  
134 clinicians were asked not to target particular patient or disease groups. All patients receiving  
135 prescriptions were asked to complete a Reconnecting Food and Health referral form. Included  
136 with the referral form was a consent to be contacted form to request patients' participation in  
137 the evaluation. Each participant signed a consent form before recruitment. Ethical approval  
138 was obtained from Cheshire North & West Research Ethics Committee (No: 05/Q1506/50).

139 Each prescription was coded with a unique patient number which was recorded on the  
140 Reconnecting Food and Health database against the referred patient's details. Each patient  
141 was provided with one prescription, which was made up of 4 vouchers. Each voucher offered  
142 a discount of £1 for every £3 (or more) spent on fresh fruit and vegetables over 4 weeks at the  
143 ASDA superstore, Halton Lea. No more than one voucher could be used at each transaction.  
144 ASDA was the principal commercial retail outlet in Runcorn used by the majority of the local  
145 population, therefore its involvement in the scheme maximised accessibility. Each time a  
146 voucher was cashed at the retailer, it was stamped and dated. This enabled identification of  
147 when and where the vouchers had been spent. The unique patient number enabled the  
148 redeemed vouchers to be matched with the corresponding patient information in the  
149 Reconnecting Food and Health database. The unique patient number was used in analysis to  
150 ensure patient information and data remained anonymous.

151 In advance of the Reconnecting Food and Health project, all clinical and  
152 administrative staff at the health centre received face to face training provided by the  
153 practice's lead health visitor and Halton PCT '5-a-day' coordinator. This training was  
154 supplemented by written briefings to emphasise the key '5-a-day' messages and strategies for  
155 tackling barriers to healthy eating. A whole practice approach to the project was adopted with  
156 bowls of fruit placed in a number of locations in the health centre, including clinicians' desks.

157 Patients were offered (free) fruit during consultations as well as while in the waiting room  
158 where they were engaged by trained volunteers. Patients were also given '5-a-day'  
159 promotional leaflets and there were leaflets and posters displayed around the health centre.  
160 Participants were assessed in relation to changes in awareness and knowledge about the  
161 recommendations, as well as improvements in fruit and vegetable consumption patterns. The  
162 instrument used was a questionnaire which was largely derived from the Department of  
163 Health FACET (Five-a-Day Consumption Evaluation Tool) questionnaire, a validated tool  
164 used to evaluate national '5-a-day' programmes and projects. The questionnaire included  
165 questions which allowed detection of changes in fruit and vegetable consumption patterns, the  
166 awareness about recommendations and portion sizes of fruits and vegetables, and the barriers  
167 to buying fruit and vegetables. Additional questions about general characteristics of  
168 participants such as eating patterns, physical activity level and alcohol consumption were  
169 included and an extended list of fruits and vegetables (consumed over the last 24 hours) was  
170 developed.

171 Furthermore, the effectiveness of the voucher scheme, including the main incentives  
172 and barriers, was assessed at repeated time points. The questionnaire was piloted on the  
173 population prior to commencement of the evaluation, members of whom were excluded from  
174 the general study population. The questionnaire was administered over the telephone at  
175 baseline (T0: 7-14 days after provision of the prescription) and followed up at 3-6 weeks (T1:  
176 short term) and 16 weeks (T2: medium term) from prescription issue. Telephone interviews  
177 were selected to reduce the inconvenience to participants and to help reduce drop out and non-  
178 response rate.

179 Data from questionnaires and redeemed prescriptions were matched and coded. SPSS  
180 v 17.0 was used for statistical analysis. Normality of data was assessed using the  
181 Kolmogorov-Smirnow test. Since data were not normally distributed, the Friedman test was  
182 used to determine whether there were significant changes in consumption patterns and to  
183 compare the results across the three time intervals. The Wilcoxon Signed Rank test was used  
184 to determine change between each of two time intervals. The percentage change in relation to  
185 participant consumption of fruit or vegetables were analysed using Chi-squared test. The  
186 Friedman test was used to rank the importance of the barriers to consumption of fruits and  
187 vegetables. Tests were performed at the 5% (0.05) significance level.

188

## 189 **Results**

190

191 Overall, 621 patients received a prescription, completed the referral form and agreed to  
192 participate in the evaluation during the five month period. This led to 124 (T0), 84 (T1) and  
193 54 (T2) people being interviewed by telephone. Table 1 shows the baseline characteristics of  
194 the participants. Participants were mostly female and described themselves as non-smoking,  
195 fairly physically active, and their household income was mostly lower than £1300 per month.  
196 The majority (96.8%) preferred supermarkets for buying fruit and vegetables. At T1, 76.2 %  
197 of participants reported that they used the prescription vouchers while purchasing fruits and  
198 vegetables. A wide range of fruits and vegetables were purchased with vouchers: apples,  
199 bananas, grapes, strawberries, oranges, watermelons, pineapples, plums, pears, carrots,  
200 potatoes, cabbage, lettuce, cauliflower and broccoli (Detailed data not shown).

201 Table 2 presents fruit and vegetable consumption in a typical day and over the 24 hour  
202 period immediately before the interviews. The results indicate that participants reported  
203 consuming 5 portions of fruit and vegetables at T0 and T1, but it was decreased to 4.5  
204 portions at the T2. However, no significant difference in consumption was obtained across the  
205 three time points nor between any two time points ( $p>0.05$ ) (Table 3). Furthermore, the  
206 consumption patterns were similar: there was no significant change in the number of  
207 participants who neither consumed fresh fruits as a part of breakfast, pure unsweetened fruit  
208 juice, fresh, frozen, tinned or dried fruits as a dessert nor a bowlful of salad ( $p>0.05$ ) (Data  
209 not shown). Although there was no statistically significant difference in the amount or pattern  
210 of consumption, a number of the participants stated that their fruit and vegetable consumption  
211 had increased compared to the consumption before the vouchers (48.8 % [n=84] and 62.7%  
212 [n=51] of participants, respectively at T1 and T2). The ‘general promotion of five a day  
213 message and importance of it’ was reported as the most effective factor in motivating  
214 participants to increase consumption at T1 and T2 (respectively, 59.4% and 45% of  
215 participants). This was followed by ‘the clinical staff providing the prescription’ and ‘fruit  
216 and vegetable in reception area/GP rooms’. On the other hand, 50.0% and 35.3% of  
217 participants, respectively at T1 and T2, stated that their consumption did not increase because  
218 of the voucher project. Their main justifications were ‘already eating lots of fruits and  
219 vegetables’, ‘insufficient value of vouchers’ and ‘quality of fruit and vegetables in the shops’.  
220 Twenty-two participants suggested some ideas for improving the programme: increase the  
221 value and time validity of vouchers, as well as extend the number of outlets where they can be  
222 used.

223 Table 4 shows the participants’ knowledge of recommendations about the number of  
224 portions of fruits and vegetables that should be consumed in a day, and the portion sizes of



225 different fruits and vegetables, based on answers to 11 questions within the questionnaire.  
226 83.7% of the participants (n=103) stated that they already knew of the '5-a-day'  
227 recommendation prior to the study, a further 14.6% (n=18) said that they had learnt of the  
228 recommendation during the study. A total score was calculated as a sum of the correct  
229 answers of questions relating to recommended daily consumption amount and portions sizes  
230 of fruit and vegetables (Figure 1). The median of the total score at T0 was 5 (with a range 0-  
231 10), whereas it was 6 at the T1 and T2 (with a range 0-10). Although the difference was not  
232 significant across the three time points (p=0.204, Friedman test), significant improvements  
233 between T0→T1 and T0→T2 were obtained (p=0.000 and p=0.048, respectively, Wilcoxon  
234 signed ranks test). The portion size of some fruit and vegetables such as apples, peas, carrots  
235 and tomatoes were correctly identified by most of the participants, however there was a lack  
236 of knowledge about the portion sizes of dried fruits, raspberry flavoured yoghurt, potato and  
237 orange squash or juices.

238 The primary barriers to fruit and vegetable consumption were stated as 'the quality of  
239 fresh fruits and vegetables' and 'the money available to spend on food' at T0, T1 and T2.  
240 However, other barriers such as 'price of fresh fruit and vegetables', 'knowledge about ways  
241 to prepare fresh fruit and vegetables', 'likes/dislikes of the household' and 'time to prepare  
242 fresh fruits and vegetables' were ranked differently in priority at different stages of the study  
243 (Detailed data not shown).

244

## 245 **Discussion**

246 Kearney *et al.* (2005) have suggested that delivering a brief intervention in the form of a  
247 prescription for fruit and vegetables supported with a '5-a-day' message could serve as a  
248 model for embedding public health action in primary care. The findings from this study  
249 indicate that the intervention was acceptable to the clinicians who introduced the brief  
250 intervention into their routine patient encounters. It was also acceptable to some patients: in a  
251 5 month period 621 patients received a prescription – 2,484 vouchers in total – and 1,188  
252 vouchers were used, a voucher usage rate of 47.8%. However, it is important to consider the  
253 reasons why consumption of fruit and vegetables did not increase.

254 It has been suggested that knowledge of the '5-a-day' recommendation is positively  
255 associated with the increased fruit and vegetable consumption (Campbell *et al.*, 1999).  
256 Baseline knowledge of the '5-a-day' recommendation was higher in this study compared with  
257 other studies (Stables *et al.*, 2002). It is therefore plausible that awareness was gained from  
258 other promotional tools such as media campaigns, reporting and general advertising and the

259 '5-a-day' logo presented on many packaging materials in supermarkets. However, the  
260 knowledge of portion sizes of various fruit and vegetable was limited. Furthermore, some  
261 participants reported that they already ate sufficient fruit and vegetables. High baseline levels  
262 of knowledge and consumption might indicate that those participating in the project and its  
263 evaluation were a self-selected group of individuals. One of the challenges to projects  
264 delivered in areas of deprivation is engaging those who have most to gain from the  
265 intervention. It may have been the case that this study tended to engage those who were  
266 already familiar with the importance of fruit and vegetable consumption and, consequently,  
267 buying and eating fruit and vegetables. Most of the participants were older than 45, female  
268 and non-smoking in this study. The potential influence of clinicians in recruitment is also  
269 relevant to note; if clinicians were viewed as valued sources of information and advice then  
270 some patients may have been more likely to participate in the study.

271 A further factor to consider is the reliability and validity of using an instrument based  
272 on self-report. The questionnaire used in this study was based on the well-validated FACET  
273 tool and self-report is commonly used to measure consumption. However, the fact remains  
274 that there is inevitably uncertainty associated with the measures of consumption used in this  
275 study and there may well have been a drift towards people reporting on the basis of social  
276 desirability. Similarly, the use of a baseline measure 7-14 days after the issuing of the  
277 prescription might have inflated some of the measures. Ideally, the baseline should have been  
278 on the day the prescription was issued (to record consumption prior to the use of the  
279 prescription). However, the participant recruitment process for which ethical approval had  
280 been given made this difficult to do in practice. For those who agreed to participate, details  
281 were passed to the researcher, who then attempted to make contact for the first time to  
282 confirm their consent and collect the baseline information (T0). In reality this process took  
283 between 7-14 days because of the time that elapsed between contact details passing from  
284 clinician to researcher and the time it then took the researcher to make contact with the  
285 patients, with, in some cases, the weekend intervening in between. It would have been  
286 difficult to have collected the information prior to the issuing of the prescription; this would  
287 have involved clinicians asking all patients seen for this information, which would have been  
288 redundant if the patients had either declined the prescription or declined to participate in the  
289 evaluation. The study design was observational and small-scale: this was thought to be  
290 justified in a context of testing out a new intervention in a novel setting with limited  
291 resources. There are also major challenges to conducting an evaluation in a 'real world'  
292 setting in which ethical issues and practical difficulties constrain design of the study. The fact

293 that this was not an experimental study design and had no control group for comparison  
294 weakens the conclusions that can be drawn from the study and indicates the need for future  
295 research in this area. The study also had a large degree of attrition over its duration; of the  
296 original 621 patients who received a prescription only 54 were contacted at 16 weeks. This  
297 may have further biased the sample due to selective drop out in favour of those who were  
298 more likely to use the vouchers, know about the value of eating fruit and vegetables and  
299 actually consume them.

300 In spite of these limitations, the study provided some insights into the perceived value  
301 of a brief intervention voucher-based scheme. The high cost and high spoilage rate of fruit  
302 and vegetable, the accessibility of fruit and vegetable shops, time needed for preparation, lack  
303 of cooking skills and difficulties in giving up favourite foods in an obesogenic environment  
304 have been reported as the main barriers to consuming fruit and vegetable in low  
305 socioeconomic groups (FSA, 2001; Reicks *et al.*, 1994; Yeh *et al.*, 2008; Pérez-Lizaur *et al.*,  
306 2008). Participants in this study reported that the high cost of fruit and vegetables was the  
307 main impediment to adequate consumption. Furthermore, participants reported that the  
308 prescription was limited in relation to the value and time validity of the vouchers as well as  
309 the limited number of outlets where vouchers could be used.

310 In conclusion, a prescription scheme for fruit and vegetables in a primary health care  
311 setting resulted in limited success. A single intervention such as in this study may not be  
312 enough on its own to lead to change in purchasing behaviour and further investigation would  
313 be needed to see if repeated or reinforced interventions would be more effective. In addition  
314 to further intervention, longer term strategies need to be developed to produce demonstrable  
315 long-term changes in behaviour via a discounted scheme and supporting educational  
316 activities.

317

### 318 **Acknowledgments**

319 We thank Susan Pike and Lucy Gray who were Public Health Nutrition students in the  
320 University of Chester for their contribution to collecting data; Prof Chris Smith for his  
321 contribution to the preparation of the manuscript; and Kathryn Melling for her contribution to  
322 the statistical analysis.

323

### 324 **Conflicts of interest, source of funding and authorship**

325 The authors declare that they have no conflict of interest.

326 The study was funded by Neighbourhood Renewal Fund and the Big Lottery Fund.

327

328 **References**

329

330 Anderson, J. V., Bybee, D. I., Brown, R. M., McLean D. F., Garcia, E. M., Breer, M. L.,  
331 Schillo B. A. (2001) 5 A Day fruit and vegetable intervention improves consumption in a low  
332 income population. *J Am. Diet. Assoc.* 101, 195-202.

333

334 Bates, B., Lennox, A., Swan, G. (2010) The National Diet and Nutrition Survey: Headline  
335 results from year 1 of the rolling programme (2008/2009). From

336 <http://www.food.gov.uk/science/dietarysurveys/ndnsdocuments/ndns0809year1> (accessed on  
337 21 August 2011)

338

339 Burr, M.L., Trembeth, J., Jones, K.K., Geen, J., Lynch, L.A., Roberts, Z.E. (2007) The effects  
340 of dietary advice and vouchers on the intake of fruit and fruit juice by pregnant women in a  
341 deprived area: a controlled trial. *Public Health Nutr.* 10, 559-65.

342

343 Campbell, M.K., Reynolds, K.D., Havas, S., Curry, S., Bishop, D., Nicklas T., Palombo, R.,  
344 Buller, D., Feldman, R., Topor M., Johnson, C., Beresford, S.A., Motsinger, B.M., Morrill,  
345 C., Heimendinger, J. (1999) Stages of change for increasing fruit and vegetable consumption  
346 among adults and young adults participating in the national 5-a-Day for better health  
347 community studies. *Health Educ. Behav.* 26, 513-34.

348

349 Casagrande, S.S., Wang, Y., Anderson, C., Gary, T.L. (2007) Have Americans increased their  
350 fruit and vegetable intake? *Am J Prev Med.* 32, 257-263.

351

352 Department of Health. (2003) A local 5-A-DAY initiative increasing fruit and vegetable  
353 consumption - improving health. Booklet 1. From

354 <http://www.dh.gov.uk/assetRoot/04/01/93/27/04019327.pdf> (accessed on 21 August 2011)

355

356 Department of Health. (2004). *Choosing Health: making healthier choices easier*. From

357 [http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidanc](http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor)  
358 [e/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT\\_ID=4094550&chk=aN5Cor](http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor)

359 (accessed on 21 August 2011)

360

361 Estaquio, C., Druesne-Pecollo. N., Latino-Martel, P., Dauchet, L., Hercberg, S., Bertrais, S.  
362 (2008) Socioeconomic differences in fruit and vegetable consumption among middle-aged  
363 French adults: adherence to the 5 A Day recommendation. *J Am. Diet. Assoc.* 108, 2021-30.  
364

365 Food Standards Agency (FSA). (2011) Breaking down the barriers to better eating. From  
366 [www.food.gov.uk/scotland/pressrelease/2991/dec/breakingbarriers](http://www.food.gov.uk/scotland/pressrelease/2991/dec/breakingbarriers) (accessed on 21 August  
367 2011)  
368

369 Guenther, P.M., Dodd, K.W., Reedy, J., Krebs-Smith, S.M. (2006) Most Americans eat much  
370 less than recommended amounts of fruits and vegetables. *J Am. Diet. Assoc.* 106, 1371-9.  
371

372 Henderson, L., Gregory, J., Swan, G. (2002) NDNS 2002 The National Diet and Nutrition  
373 Survey: Adults Aged 19 to 64 Years. Vol 1: Types and Quantities of Food Consumed.  
374 London: The Stationery Office.  
375

376 Herman, D.R., Harrison, G. G., Jenks, E. (2006) Choices made by women provided with an  
377 economic supplement for fresh fruit and vegetable purchase. *J Am. Diet. Assoc.* 106, 740-744.  
378

379 Kearney, M., Bradbury, C., Ellahi, B., Hodgson, M., Thurston, M. (2005) Mainstreaming  
380 prevention: Prescribing fruit and vegetables as a brief intervention in primary care. *Public*  
381 *Health*, 119, 981-986.  
382

383 Kunkel, M.E., Luccia, B., Moore, A.C. (2003) Evaluation of the South Carolina seniors  
384 farmers' market nutrition education program. *J Am. Diet. Assoc.* 103: 880-883.  
385

386 Marmot, M. (2007) Achieving health equity: from root causes to fair outcomes. *Lancet*  
387 29;370 (9593):1153-63.  
388

389 National Neighbourhood Statistics. (2000) Indices of deprivation for wards in England. From  
390 [http://neighbourhood.statistics.gov.uk/Reports/eng/tableviewer/wdsview/dispviewp.asp?dsid=](http://neighbourhood.statistics.gov.uk/Reports/eng/tableviewer/wdsview/dispviewp.asp?dsid=474)  
391 [474](http://neighbourhood.statistics.gov.uk/Reports/eng/tableviewer/wdsview/dispviewp.asp?dsid=474) (accessed on 21 August 2011)  
392  
393

394 Pérez-Lizaur, A.B., Kaufer-Horwitz, M., Plazas, M. (2008) Environmental and personal  
395 correlates of fruit and vegetable consumption in low income, urban Mexican children. *J.*  
396 *Hum. Nutr. Diet.* 21(1), 63-71

397

398 Pollard, J., Greenwood, D., Kirk, S. Cade, J. (2001) Lifestyle factors affecting fruit and  
399 vegetable consumption in the UK Women's Cohort Study. *Appetite*, 37, 71-79.

400

401 Reicks, M., Randall, J.L., Haynes, B.J. (1994) Factors affecting consumption of fruits and  
402 vegetables by low-income families. *J Am. Diet. Assoc.* 94, 1309-1311.

403

404 Stables, G.J., Subar, A.F., Patterson, B.H., Dodd, K., Heinmendinger, J., Van Duyn, M.A.,  
405 Nebeling, L. (2002). Changes in vegetable and fruit consumption and awareness among US  
406 adults: results of the 1991 and 1997 5 A Day for Better Health Program surveys. *J Am. Diet.*  
407 *Assoc.* 102: 809-17.

408

409 World Health Organisation. (2002) Food and health in Europe: A new basis for action  
410 summary. From <http://www.euro.who.int/document/e78578.pdf> (accessed on 21 August  
411 2011)

412

413 World Health Organisation. (2009) *Fruit, Vegetables and NCD prevention*. From  
414 [http://www.who.int/dietphysicalactivity/media/en/gsfsv\\_fv.pdf](http://www.who.int/dietphysicalactivity/media/en/gsfsv_fv.pdf) (accessed on 21 August 2011)

415

416 Yeh, M.C., Ickes, S.B., Lowenstein, L.M., Shuval, K., Ammerman, A. S., Farris, R., Katz,  
417 D.L. (2008). Understanding barriers and facilitators of fruit and vegetable consumption  
418 among a diverse multi-ethnic population in the USA. *Health Promot. Int.* 23, 42-51.

419

420

421

422 **Figure 1. Total score of the correct answers to questions relating to recommended daily**  
423 **consumption amount and portions sizes of fruit and vegetables**

Fig 1: Total correct answer score

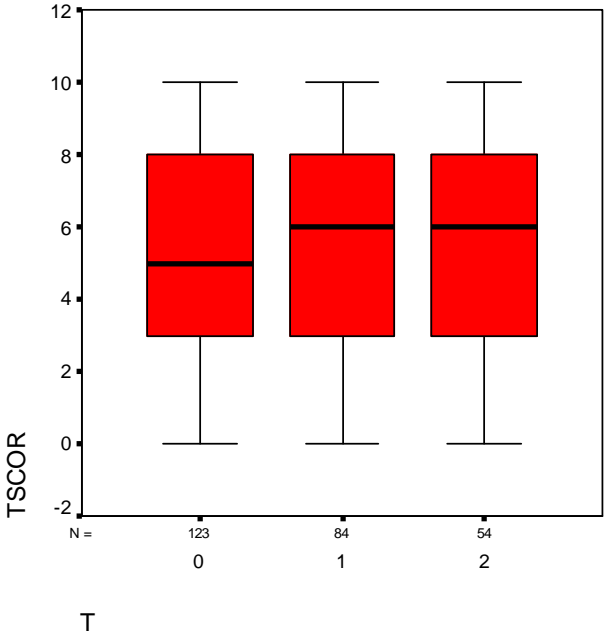


Table 1: General Characteristics of Participants

	Total(n=124)	Male (n=35)	Female (n=89)
<b>Age</b>	<b>%</b>	<b>%</b>	<b>%</b>
16-25 years	10.5	0.0	14.6
26-35 years	12.1	2.9	15.7
36-45 years	16.9	8.6	20.2
46-55 years	12.1	8.6	13.5
56-65 years	25.0	42.8	18.0
65-70 years	8.1	14.3	5.6
70 years +	15.3	22.8	12.4
<b>Monthly income</b>			
<£430	15.3	20.0	13.5
£431- £870	33.9	22.9	38.2
£871- £1300	19.4	28.6	15.8
£1301- £1730	8.1	11.4	6.7
More than £1730	10.5	11.4	10.1
Do not know	12.9	5.7	15.7
<b>Smoking Status</b>			
Yes	32.3	31.4	32.6
No	67.7	68.6	67.4
<b>Consumption of Alcoholic Drinks</b>			
Yes	64.5	77.1	59.6
Never	35.5	22.9	40.4
<b>Physical active level</b>			
Very active	19.4	20.0	19.1
Fairly active	43.5	54.3	39.3
Not very active	27.4	14.3	32.6
Not at all active	9.7	11.4	9.0
<b>The place which most of fruit and vegetables were bought from</b>			
Supermarket	96.8	94.2	97.8
Greengrocers	0.8	2.9	0.0
Halton Food Co-op	0.8	2.9	0.0
Others	1.6	0.0	2.2



Table 2: Fruit & vegetable consumption patterns

	T0 (n=124) Median (Min-Max)	T1 (n=84) Median (Min-Max)	T2 (n=54) Median (Min-Max)	p
Usual fresh fruit consumption (no of portions per day)	3 (0-7)	3 (0-7)	2.5 (0-6)	0.433
Usual vegetable consumption (no of portions per day)	2 (0-7)	2 (0-7)	2 (0-4)	0.562
Fruit (fresh, frozen, dried or tinned) consumption over the previous 24 hour period (no of portions)	2 (0-7)	2 (0-7)	2 (0-7)	0.371
Vegetable (fresh, frozen, dried or tinned) consumption over the previous 24 hour period (no of portions)	2 (0-7)	2 (0-7)	2 (0-6)	0.426

Table 3: Evaluation of the differences in consumption pattern between two interview time points

	p value
Usual fresh fruit consumption(no of portions per day)	0.433
T0→ T1	0.335
T0→ T2	0.305
T1→ T2	0.186
Fruit (fresh, frozen, dried or tinned) consumption over the previous 24 hour period (no of portions)	0.371
T0→ T1	0.659
T0→ T2	0.124
T1→ T2	0.387
Usual vegetable consumption (no of portions per day)	0.562
T0→ T1	0.994
T0→ T2	0.577
T1→ T2	0.725
Vegetable (fresh, frozen, dried or tinned) consumption over the previous 24 hour period (no of portions)	0.426
T0→ T1	0.940
T0→ T2	0.354
T1→ T2	0.082