

Using the mass-media to target obesity: an analysis of the characteristics and reported behaviour change of participants in the BBC's 'Fighting Fat, Fighting Fit' campaign

A. Miles, L. Rapoport, J. Wardle, T. Afuape and M. Duman^{1,2}

Abstract

The study aimed to assess the characteristics and reported behaviour change of participants in the BBC's 'Fighting Fat, Fighting Fit' (FFFF) campaign. A postal questionnaire survey was sent to a random sample of 6000 adults registering with the FFFF campaign at the start of the campaign and 5 months later. Demographic characteristics, weight, eating behaviour and activity patterns were assessed. In total, 3661 respondents completed the baseline questionnaire and 2112 (58%) of these completed a follow-up evaluation questionnaire 5 months later. The majority of evaluation participants were women and classified as 'overweight' or 'obese'. Participants reported significant reductions in weight, and in fat and snack intake, and significant increases in exercise levels, and in fruit, vegetable and starch intake during the 6 months of the campaign. These effects remained significant if non-responders were assumed to have made no change. These results show that mass-media campaigns might make a contribution to weight control at the population level, but particular subgroups such as men and people

under 25 may require specifically targeted campaigns. In addition, whilst such campaigns may initially attract obese people, they may be more likely to drop out of the campaign than overweight and normal weight individuals.

Introduction

Obesity increases the risk of numerous chronic and potentially fatal diseases and is currently one of the most avoidable causes of ill-health in the UK, second only to smoking (WHO, 1998). More than half of the British adult population are now classified as overweight (63% of men and 55% of women) and one in five as 'obese' (18% of men and 23% of women) (Department of Health, 1998a). The current consensus is that an environment promoting sedentary lifestyles and the consumption of energy-dense foods is the primary cause of this increase in obesity (WHO, 1998). It is widely acknowledged that there is an urgent need to reverse this trend, and that changes need to occur both at the level of the environment, and individuals' eating and exercise habits, if prevalence rates are to be reduced.

In their report on obesity, WHO (WHO, 1998) suggests that the mass-media has an important role to play in reducing obesity, through promoting healthy diets and exercise, although comparatively few mass-media health campaigns have specifically targeted obesity. Some campaigns have targeted factors that contribute to obesity (e.g. fat intake and exercise levels), but their main focus has been on cardiovascular disease rather than obesity *per se*, such as the 'Heart for Life Campaign' carried out in Norway (Sogaard and Fonnebo, 1992) and

Imperial Cancer Research Fund, Health Behaviour Unit,
Department of Epidemiology and Public Health,
University College London, 2–16 Torrington Place,
London WC1E 6BT and 'BBC Education, 201 Wood
Lane, London W12 7TS, UK

²Present address: Health Team Leader (B2B), Hutchison
3G, MWB Business Exchange, Siena Court, The
Broadway, Maidenhead SL6 1NJ, UK
Correspondence to: J. Wardle

the Stanford Five-City project carried out in the USA (Farquhar *et al.*, 1990). Whilst obesity contributes to cardiovascular disease, its role in numerous other diseases makes it worth targeting in its own right.

In January 1999, the British Broadcasting Corporation (BBC) launched its largest ever health education campaign, 'Fighting Fat, Fighting Fit' (FFFF), to explicitly target rising levels of obesity by educating and encouraging people to eat more healthily and become more active. In line with WHO recommendations, its main message was intended to encourage viewers and listeners to make small and permanent changes to their diet and lifestyle rather than to aim for rapid short-term weight loss.

There is little doubt that mass-media health campaigns can increase knowledge and enhance awareness of health-related issues, but evidence that they can stimulate behaviour change is less convincing (van Wechem *et al.*, 1997; Cavill, 1998; Flay and Burton, 1990). Behavioural change has been demonstrated where campaigns have included multiple elements in addition to mass-media programming, e.g. combining population-wide broadcasts with the provision of local level support. The Stanford Heart Disease Prevention Program and the North Karelia Project both achieved community-wide reductions in cardiovascular disease following intensive education programmes on cardiovascular risk factors along with community services such as face-to-face counselling and self-help groups (Farquhar *et al.*, 1985; Tuomilehto *et al.*, 1986). More recently, campaigns such as the 'Fit for Life' programme in Finland demonstrated a significant change in activity levels following intensive mass-media campaigning and the creation of local exercise schemes (Vuori *et al.*, 1998). Campaigns which have relied on mass-media programming alone, however, have shown that behaviour change may be limited to those who actively respond to and join a campaign. For example, Wimbush *et al.*'s evaluation of a mass-media campaign to encourage people living in Scotland to exercise more, found that it had no effect on the exercise levels of the

general population, although there were increases in reported exercise levels among people who called the campaign telephone information line (Wimbush *et al.*, 1998).

In an extensive review, Flay and Burton have argued for the need to document which campaigns have worked, for whom and under what conditions, in order to enhance the effectiveness of future initiatives (Flay and Burton, 1990). Documenting the characteristics of people who respond to mass-media health campaigns is clearly of value, as it is important to know whether a campaign recruits those most in need of behaviour change; however, such research is scarce. There is evidence that those who participate in mass-media health campaigns tend to be from higher socio-economic groups and already engaging in better health practices (Malmgren and Andersson, 1986; Rissel, 1991; Smith *et al.*, 1995). For example, research on the *Bodyshow* series, broadcast in Australia in 1988 to educate people about leading healthy lifestyles, showed that those who responded to invitations for further information tended to be women, aged 25–39, married and well-educated (Rissel, 1991). Malmgren and Andersson found those registering with a newspaper health information campaign run in Sweden, which offered advice on smoking cessation, diet and exercise, tended to be women, aged 30–49, and with better dietary, smoking and exercise habits than the average population (Malmgren and Andersson, 1986). Health campaigns also tend to recruit people at a higher stage of readiness to change. In the smoking field, people who had increased motivation to quit at the start were more likely to request programme materials (Sussman *et al.*, 1994) and a higher stage of readiness to quit was an independent predictor of participation in a televised smoking cessation intervention programme (Freels *et al.*, 1999). There has been little documentation of who responds to campaigns directed towards obesity, but if these results apply in the obesity field participants might be expected to be female, better educated than average and already following more weight control practices.

Any campaign which aims to promote behaviour

change first needs to ensure that it reaches its target audience (Flay and Burton, 1990). Population awareness of the FFFF campaign has been documented elsewhere (Wardle *et al.*, 2001). It showed that awareness of the campaign was high (57%), spread across all socio-economic groups, and included the obese and overweight as well as the normal weight. The aim of the present study was to assess the characteristics of those who participated actively in the campaign (as opposed to merely being aware of it), and examine demographic and anthropometric predictors of behaviour change, to determine both who responded to, and who benefited most from, the FFFF campaign.

Method

The FFFF campaign was the largest health education campaign ever undertaken by the BBC and spanned 7 weeks of peak and day-time programming across BBC television and radio. It was explicitly targeted towards groups with a higher prevalence of obesity and the main message of the campaign was that weight problems are best tackled with small but permanent changes to diet and exercise, rather than short-term dieting to achieve rapid weight loss. Full details of the campaign programming, target audience, campaign message, campaign advertising trails, programmes and the accompanying FFFF book and video are given in Wardle *et al.* (Wardle *et al.*, 2001).

Registration scheme and booklet

The campaign message was supplemented with a booklet which was part of the campaign registration scheme. The booklet offered practical advice about how lifestyle changes in eating and activity might be achieved. The booklet also contained registration cards for people to actively register with the campaign. The registration scheme was highlighted during and after the programmes throughout the 7 weeks of the campaign, and offered 6 months of membership. There were three registration cards to return over a 5-month period to chart progress in weight loss, activity levels and eating habits. These cards also included questions about age, sex

and current weight, and hence gave some details of those who registered with the FFFF campaign (campaign 'registrants'). People were offered incentives to register with the campaign, those sending back the second registration card received a voucher for a free exercise session in one of over 1050 participating fitness centres in the UK. Additionally, participants who showed the greatest improvement in eating and activity habits over the 6-month period of the campaign, had a chance to win prizes such as a year's supply of fruit and vegetables or a home visit by a health and fitness expert.

Logic of the campaign

The campaign aimed to stimulate behaviour change, and consistent with this aim was based on behaviour change theories such as Social Learning Theory (Bandura, 1977, 1986) and the Health Belief Model (Becker, 1974). It also used elements outlined by Flay and Burton in their review of effective mass communication strategies for health campaigns (Flay and Burton, 1990). Hence programmes such as *Weight of the Nation* and *Body Spies* modelled the desired behaviour, showed it to be effective in achieving the desired results and presented it as pertinent to real-life situations. Both the programmes and the booklet provided specific guidance for self-management of behaviour change and for coping with lapses. In addition, they aimed to mobilize social support for behaviour change, by encouraging people to join together in making lifestyle changes, to solicit support for their individual lifestyle changes, and by offering incentives to use local fitness centres and thereby encourage the use of pre-existing infrastructures.

Design and sampling procedures

The present study comprised a survey carried out at the start of, and after the end of, the campaign, in a randomly selected sample of 6000 people out of a total of 33 474 campaign registrants who had returned the first registration card within the first few weeks of the campaign (~2% of these indicated they did not want their details disclosed for social research purposes and they were not included).

The 6000 campaign registrants were sent a 3-page questionnaire with a unique registration number, a pre-paid return envelope and a request to return the completed questionnaire within 7 days. This questionnaire had to be sent out following the launch of the campaign, as that was when details of the campaign registrants became available, hence pre-campaign (baseline) behaviour was assessed retrospectively. Those who completed the first questionnaire were sent a follow-up questionnaire 5 months later (just over 6 months after the start of the campaign).

Change was assessed by comparing measures of weight, diet and activity from before and after the campaign. For registrants who failed to return the follow-up questionnaire, baseline scores were carried forward as the follow-up figure, to provide a conservative estimate of the impact of the programme.

For the purpose of this paper, people registering with the FFFF campaign are referred to as campaign 'registrants'. Those completing at least the first evaluation questionnaire are referred to as 'evaluation participants'. This latter group are sub-divided into: (1) 'completers' (who completed both the baseline and follow-up evaluation questionnaires) and (2) 'non-completers' (who completed only the baseline questionnaire).

Measures

The pre-campaign questionnaire incorporated a range of standardized measures to assess eating and activity patterns as well as simple demographic questions. In addition it asked questions about goals set and expectations of weight loss prior to the campaign, and also about participation in the campaign (e.g. programmes watched, whether participants bought the book/video, contacted one of the campaign information lines). The post-campaign questionnaire assessed weight, eating and activity patterns to estimate changes in weight, diet and exercise. Both questionnaires also included items relating to psychological well-being, because weight problems have been linked to such psychological variables.

Dietary intake

Dietary intake questions assessed specific behaviours such as snacking, fat intake, and fruit and vegetable intake, changes in which were recommended as part of long-term lifestyle change rather than as part of specific diets for rapid short-term weight loss. Questions were selected from the Dietary Instrument for Nutrition Education (DINE) (Roe *et al.*, 1994) and modified slightly to suit the purposes of the survey. This measure has been designed to give quick and reliable indications of dietary fat and fibre intake. Questions adapted from this measure covered fruit and vegetable intake, snack and fried food intake, numbers of rounded teaspoons of butter/margarine and low-fat spread used per day and type of milk usually consumed. A question about starch intake was designed specifically for FFFF campaign evaluation: 'How often do starchy foods (from the bread, cereals, potatoes, rice and pasta group) make up the main part of your meal (at least a third of a plateful)?': 'every meal', '2 meals a day', '1 meal a day', 'less than 1 meal a day'. Participants were also asked how many units of alcohol they drank over the whole week.

Activity levels

Activity levels were assessed using an adapted version of the International Physical Activity Questionnaire which is currently in preparation [see (Booth, 2000)]. The questionnaire assessed the frequency and duration of three types of exercise: brisk walking, moderate exercise and vigorous exercise. Brisk walking was defined as walking at a brisk pace to get from place to place, for recreation, pleasure or exercise; moderate activity was defined as doing activities which took moderate effort like easy cycling or swimming, raking or sweeping (and was explicitly defined to exclude walking); and vigorous exercise was defined as activities which took vigorous or hard effort like digging, jogging, fast cycling, fast swimming, soccer or shovelling snow. People were asked to indicate how many days they had done each of these three types of exercise for at least 10 min and were given the following response

options: 'daily', '4–6 times a week', '2–3 times a week', 'once a week', 'never', 'cannot exercise'. They were also asked to indicate, on the days on which they had done each of the three forms of exercise, approximately how long they had done each for, in hours and minutes.

Weight-related items

Participants were asked to give their weight and height in their unit of choice (stones/pounds or kilograms). Weight cycling was assessed on a five point scale by asking participants how often they had lost and put back on 10 or more pounds in weight since early teens (excluding pregnancy and illness), with response options: 'never', '1–2 times', '3–5 times', '6–9 times' and '10+ times'. Satisfaction with weight was assessed on a 5-point, Likert scale with response options: 'very satisfied', 'quite satisfied', 'undecided', 'quite dissatisfied' and 'very dissatisfied'. Participants were also asked to report both their desired weight loss ('By taking part in the FFFF campaign over the next 3 months, how much weight would you ideally like to lose?') and their expected weight loss over the duration of the campaign ('By taking part in the FFFF campaign over the next 3 months, how much weight do you think you will really lose?').

Psychological measures

General psychological well-being was assessed using items from the Short-Form-36 (SF-36) health status questionnaire (Ware *et al.*, 1993), designed to assess health outcomes over relatively short periods and to be used in population surveys. Three questions were used in the current study: one question about general health, one about energy levels and one about low mood. Together they had reasonable internal reliability (Cronbach's $\alpha = 0.66$).

Eating behaviour

Three questions were selected from the emotional eating scale of the Dutch Eating Behaviour Questionnaire (DEBQ) (van Strien *et al.*, 1986). These questions assessed eating when: (1) irritated, cross or disappointed, (2) depressed or discouraged and

(3) anxious, worried or tense. Together they had high internal reliability (Cronbach's $\alpha = 0.86$).

Demographic information

Information on sex, age and marital status was obtained along with several socio-economic indicators, (highest educational qualification, work status, housing tenure and car ownership) using questions from the UK General Household Survey (Thomas *et al.*, 1998). A simple index of socio-economic deprivation was computed with participants being assigned a point for having no educational qualifications/only being educated up to CSE level, not owning a car and not owning their own home respectively. Hence the scores on this index ranged from 0 (lower deprivation) to 3 (higher deprivation).

Involvement in the FFFF campaign

A score of involvement in the FFFF campaign was calculated by simple summation of the number of the following elements of the campaign that people had participated in: watched *Weight of the Nation*, watched *Fat Free*, watched *Fat Files* (*Horizon* trilogy), watched *Body Spies*, watched *Watchdog Healthcheck*, watched other TV programmes, listened to Radio 2, listened to English Local Radio, listened to other radio programme, read press/publication, visited the FFFF website, visited BBC News on-line, visited FFFF Ceefax pages, called BBC Action Line, used the FFFF book, used the FFFF video. For some analyses this was divided into involvement in broadcasting (number of TV programmes watched and radio programmes listened to) and more active involvement (i.e. whether they purchased the accompanying FFFF book and/or video). Involvement was assessed in the baseline questionnaire, 5 weeks into the FFFF campaign's 7-week run.

Data analyses

Logistic regression was used to establish the independent predictive effects of baseline variables on whether evaluation participants completed the follow-up questionnaire or not. Logistic regression was also used to investigate demographic

predictors of behaviour change. Results are shown as odds ratios (e.g. ratios of the odds of reporting significant behaviour change in each group compared with the reference group) with confidence intervals for the odds ratio. Where confidence intervals do not include 1, the odds of completing the follow-up questionnaire/making lifestyle changes in that group is significantly different from the reference group. Related *t*-tests and χ^2 tests were used to assess behavioural change. These analyses were conducted twice for each variable. The first set of analyses included all evaluation participants and assumed that those who had not completed the follow-up questionnaire had made no changes to their eating or activity patterns, so their baseline scores were carried forward. Scores computed using the latter measure give a conservative estimate of behavioural change and it is this estimate that is reported. The second included only those evaluation participants who completed both the baseline and the follow-up questionnaires. The outcome measure based on completers only is given in brackets. The statistical tests are reported only for the conservative estimate based on all evaluation participants but of course were even more significant in the sample of completers only.

Results

Response rates and characteristics of campaign registrants

In total, 237 865 registration packs were sent out by the BBC in the first few weeks of the campaign, from which 33 474 registration cards were returned (14% of those requesting a pack). The BBC's geo-demographic analysis of telephone requests showed that the distribution of those telephoning the campaign line to request a pack was evenly distributed across the different socio-demographic categories.

The registration card generated limited demographic and anthropometric data on the full sample of participants joining the campaign. This information is shown in Table I and indicates that the majority of campaign registrants were women,

aged 25–64, and classified as 'overweight' or 'obese' on the basis of self-reported height and weight, although there was a high level of non-completion of individual items.

Response rates and characteristics of evaluation participants

A random sample of 6000 of those registering with the FFFF campaign were sent a baseline questionnaire, of which 3661 were returned (61%). The information on this group, the 'evaluation participants', was compared with the limited data on all campaign registrants (see Table I). The results suggest that evaluation participants probably did not differ in terms of age and sex from the full sample of registrants, but that they were more likely to be obese.

Evaluation participants were sent a follow-up questionnaire 5 months after completing the baseline questionnaire. Approximately 1500 follow-up questionnaires were returned within 2 weeks and a reminder questionnaire was mailed to the remaining 2500. Altogether 2112 people completed and returned the follow-up questionnaire (58% of those completing the first questionnaire; 35% of the original random sample of 6000). Table II shows the demographic and anthropometric characteristics of all evaluation participants, and those who went on to complete both questionnaires. The level of non-completion of items on the baseline and follow-up questionnaires was low (typically less than 2%). The exception was the activity measure where the non-completion rate was 12%. Results relating to the latter should therefore be treated with caution.

As shown in Table II, the majority of evaluation participants were female, aged between 35 and 64. The more detailed information from the baseline questionnaire showed that most were in paid work and had some educational qualifications. Evaluation participants differed from the British adult population in terms of gender, age, education, social class, weight and exercise levels [comparative data from: (Thomas *et al.*, 1998; Bridgwood *et al.*, 2000; Department of Health, 1998b; Health Education Authority, 1996)]. Evaluation parti-

Table I. Sex, age and BMI of registrants and evaluation participants in the FFFF campaign (percentages with sample size in brackets)

	Campaign registrants (n = 33474)	Evaluation participants (n = 3661)	Evaluation participants completing follow-up (n = 2112)
Sex (%)			
female	78.9 (26430)	86.3 (3161)	86.3 (1824)
male	10.9 (3669)	13.4 (488)	13.4 (282)
not recorded	10.2 (3375)	0.3 (12)	0.3 (6)
Age (%)			
up to 24	6.0 (2022)	6.0 (219)	3.6 (77)
25–34	20.5 (6867)	25.0 (917)	20.0 (422)
35–64	42.1 (14084)	61.8 (2263)	66.7 (1409)
65+	4.2 (1401)	7.0 (258)	9.6 (202)
not recorded	27.2 (9100)	0.2 (4)	0.1 (2)
BMI categories (%)			
normal: <25	12.9 (4309)	8.5 (311)	9.2 (194)
overweight: 25–29.9	32.9 (11008)	32.8 (1202)	35.4 (748)
obese: 30+	44.2 (14782)	56.8 (2079)	53.4 (1128)
not recorded	10.0 (3375)	1.9 (69)	2.0 (42)

participants were more likely to be aged between 25–49 (87 versus 67%), have an educational qualification (84 versus 69%), have a degree (18 versus 11%), be in paid work (64 versus 57%), have access to a car/van (85 versus 72%) and own their home (75 versus 69%), suggesting they came from higher socio-economic groups. They were less likely to be smokers (13 versus 27%). However, they were also less likely to be classified as ‘vigorous exercisers’ (3 versus 12%) and more likely to be classified as ‘obese’ (58 versus 21%) compared with the British adult population.

Table III shows the level of involvement in the different aspects of the FFFF campaign reported by the evaluation participants. People’s principal involvement with the campaign was through the TV programmes, although a large proportion reported buying the FFFF book (about 40%). Involvement with the campaign through other mediums, such as radio or electronic media, was reported by less than 10% of evaluation participants.

Completion of the follow-up questionnaire could, in itself, be used as an indicator of more sustained participation in the campaign, and was independently predicted by being older, unmarried, having more education, owning rather than renting accommodation and being a non-smoker. This

suggests that adults from higher socio-economic groups not only were more likely to respond in the first place, but also had more sustained participation in the campaign. Completion of the follow-up questionnaire was lower among the obese, who were significantly less likely than overweight or normal weight people to return the follow-up questionnaire (see Table IV). Completers also reported higher levels of involvement in the first 5 weeks of the FFFF campaign in general. The univariate relationship with completion of the follow-up questionnaire was significant and it made a significant unique contribution to prediction of completion of the follow-up questionnaire when it was entered alongside the variables listed in Table IV. This supports the interpretation of return of the follow-up questionnaire as reflecting more active participation. Pre-campaign health behaviours (fruit and vegetable intake, fried food and snack intake, and activity level) were not significantly associated with completion of the follow-up questionnaire.

Weight loss

Of evaluation participants, 99% said that they wanted to lose weight as a result of joining the FFFF campaign and 97% expected to lose weight.

Table II. Demographic characteristics of evaluation participants and those who completed the follow-up questionnaire (completers)

	Full sample (n = 3661)	Completers (n = 2112)
Sex (%)		
female	86.6 (3161)	86.6 (1824)
male	13.3 (488)	13.3 (282)
Age (%)		
up to 24	6.0 (219)	3.7 (77)
25–34	25.1 (917)	20.0 (422)
35–49	36.3 (1328)	36.6 (773)
50–64	25.6 (935)	30.1 (636)
65+	7.0 (258)	9.6 (202)
Education (%)		
degree or equivalent	18.4 (668)	20.2 (422)
teaching/profession qualification	16.7 (603)	17.5 (366)
A level or equivalent	15.4 (559)	14.6 (305)
GCSE O level or equivalent	25.1 (908)	23.8 (497)
CSE or equivalent	8.8 (318)	7.4 (154)
no qualification	15.6 (565)	16.4 (343)
Work status (%)		
in paid work	63.8 (2243)	61.6 (1240)
not in paid work	36.2 (1271)	38.4 (774)
Marital status (%)		
single	15.0 (549)	13.6 (287)
married/cohabiting	67.6 (2468)	67.1 (1412)
separated	2.5 (92)	2.6 (55)
divorced	10.5 (383)	11.1 (234)
widowed	4.4 (160)	5.5 (116)
Accommodation (%)		
owned	75.3 (2724)	78.7 (1641)
rented	24.7 (893)	21.3 (443)
Household with car (%)		
yes	85.3 (3111)	85.6 (1801)
no	14.7 (535)	14.4 (303)
Smoking (%)		
yes	12.7 (461)	10.0 (209)
no	87.3 (3175)	90.0 (1889)
Units alcohol per week (mean)	6.82 (3575)	6.84 (2027)

Participants said they aimed to lose an average 13.4 kg (SD = 8.1; range 0–95 kg) but expected to lose 7.8 kg (SD = 5.1; range 0–63 kg).

As shown in Table V, participants reported lower weights after than before the programme, although the average BMI remained in the ‘obese’ category.

Table III. Percentage of evaluation participants who recorded involvement in the different elements of the FFFF campaign

	Percent responding ‘yes’
TV programmes	
watched <i>Fat Free</i>	76.8
watched <i>Watchdog Healthcheck</i>	51.2
watched <i>Weight of the Nation</i>	49.8
watched <i>Fat Files (Horizon trilogy)</i>	34.8
watched <i>Body Spies</i>	25.4
watched other TV Programmes	30.0
Radio programmes	
listened to Radio 2	9.7
listened to English Local Radio	4.4
listened to other radio programme	6.4
FFFF publications/merchandising	
used the FFFF book	39.5
used the FFFF video	4.9
Other	
read press/publication	27.6
visited the FFFF Website	5.3
visited BBC News on-line	1.7
visited FFFF Ceefax pages	9.2
called BBC Action Line	5.6

The average post-campaign weight was 2.3 kg (4.2 kg) lower than before the campaign ($t = 29$, d.f. = 3632; $P < 0.001$) with 44% (78%) losing weight (outcomes based on completing evaluation participants are given in brackets). The percentage of people classified as ‘obese’ reduced by 6% (11%) ($\chi^2 = 2710$, d.f. = 1; $P < 0.001$), although 52% (44%) of the sample remained in the ‘obese’ category. Satisfaction with weight also improved ($t = 22$, d.f. = 3646; $P < 0.001$) and the percentage saying they were either ‘very’ or ‘quite’ satisfied with their weight increased from 3 to 11% (3 to 17%).

Changes in dietary intake

There were significant changes in all the dietary behaviours that were assessed. Fruit and vegetable intake increased by 0.8 (1.3) portions per day ($t = 27$, d.f. = 3629; $P < 0.001$); the percentage eating the recommended 5 portions of fruit and vegetables a day increased by 13% (23%) ($\chi^2 =$

Table IV. Predictors of participation in follow-up (odds ratios with confidence intervals)

	Univariate analyses	Multivariate analyses (adjusted for all other variables in the equation)
Sex		
male	(1.00)	(1.00)
female	0.99 [0.82–1.20]	1.12 [0.90–1.38]
Age group		
<18–24	(1.00)	(1.00)
25–34	1.57 ^a [1.16–2.13]	1.82 ^a [1.31–2.53]
35–49	2.57 ^a [1.90–3.46]	2.98 ^a [2.15–4.14]
50–64	3.92 ^a [2.87–5.34]	4.28 ^a [3.04–6.03]
65+	6.65 ^a [4.43–9.98]	6.69 ^a [4.13–10.86]
Education		
no qualification/ CSEs/GCSEs or equivalent A' levels or equivalent	(1.00)	(1.00)
degree/ teaching/ profession qualification	0.96 [0.79–1.16]	1.12 [0.91–1.38]
degree/ teaching/ profession qualification	1.31 ^a [1.13–1.51]	1.30 ^a [1.11–1.54]
Marital status		
single/separated/divorced/widowed	(1.00)	(1.00)
married/cohabiting	0.95 [0.82–1.09]	0.84 ^a [0.71–0.99]
Work status		
in paid work	(1.00)	(1.00)
not in paid work	1.25 ^a [1.09–1.45]	1.21 ^a [1.02–1.42]
Accommodation		
owned	(1.00)	(1.00)
rented	0.64 ^a [0.55–0.75]	0.77 ^a [0.64–0.93]
Car ownership		
household with car	(1.00)	(1.00)
without car	0.95 [0.79–1.14]	1.21 [0.95–1.52]
Smoking		
yes	(1.00)	(1.00)
no	1.77 ^a [1.45–2.15]	1.36 ^a [1.08–1.69]
Alcohol units per week	0.99 [0.99–1.01]	0.99 [0.99–1.01]
BMI		
normal: <25	(1.00)	(1.00)
overweight: 25–29.9	0.99 [0.76–1.28]	0.84 [0.63–1.11]
obese: 30+	0.71 ^a [0.55–0.91]	0.62 ^a [0.47–0.82]
Campaign involvement (continuous measure)	1.06 ^a [1.02–1.09]	1.06 ^a [1.02–1.10]

^aStatistically significant.

1277, d.f. = 1; $P < 0.001$); the number of participants eating fried food less than once a week increased by 16% (28%) ($\chi^2 = 1393$, d.f. = 1; $P < 0.001$); the proportion consuming whole milk decreased from 10 to 7% (9 to 4%) ($\chi^2 = 4407$, d.f. = 4; $P < 0.001$). Cutting the visible fat off meat increased: 12% (22%) shifted from doing

this rarely/often to usually/ always ($\chi^2 = 1601$, d.f. = 1; $P < 0.001$). Snack intake (i.e. consumption of biscuits, chocolate, crisps, etc.) decreased by 3 (5) snacks per week ($t = 31$, d.f. = 3648; $P < 0.001$). The number of starch-based meals increased very slightly, with 4% (6%) changing from eating one or fewer starch-based meals per

Table V. Change in anthropometric and weight-related characteristics of all evaluation participants and completers (means or percentages)

	Full sample (<i>n</i> = 3661)			Completers (<i>n</i> = 2112)		
	Baseline	Post-intervention	Mean change [95% CI] or % change ^a	Baseline	Post-intervention	Mean change [95% CI] or % change ^a
Weight (kg)	85.7	83.3	2.3 [2.2–2.5]	84.3	80.1	4.2 [3.9–4.4]
BMI	32.2	31.3	0.88 [0.82–0.94]	31.7	30.2	1.6 [1.5–1.7]
BMI categories (%)						
normal	8.7	12.9	4.2	9.3	16.9	7.6
overweight	33.5	35.3	1.8	36.3	39.5	3.2
obese	57.8	51.8	6.0	54.4	43.6	10.8
Satisfaction with weight (5 = very satisfied)	1.51	1.82	0.31 [0.28–0.34]	1.53	2.07	0.54 [0.50–0.59]

^aAll changes are statistically significant at $P < 0.001$.

day to eating two or more starch-based meals a day ($\chi^2 = 1341$, d.f. = 1; $P < 0.001$). The number of pats butter/margarine used decreased by 0.6 (1.3) ($t = 13$, d.f. = 2199; $P < 0.001$) and number of pats of low-fat spread reduced by 0.4 (0.7) ($t = 10$, d.f. = 2492; $P < 0.001$) although it should be noted that people tended to respond to either the question about butter/margarine or the question about low-fat spread. Average weekly alcohol intake reduced by an average of 0.9 (1.6) units per week ($t = 10$, d.f. = 3574; $P < 0.001$) (see Table VI).

Changes in activity

There were significant increases in brisk walking, moderate activity and vigorous activity. Overall, 39% (74%) of participants increased their activity levels following the campaign. Total number of minutes spent in activity per week increased by 94 (181) min per week ($t = 16$, d.f. = 3505; $P < 0.001$). The amount of brisk and moderate activity people reported doing were added together and on the basis of this people were categorized into whether they were 'sedentary' (doing less than one 30-min session of exercise per week), doing 'irregular moderate' exercise (more than one but less than five 30-min sessions of exercise per week), or 'regular moderate' exercise (five or more 30-min sessions of exercise per

week). The percentage of participants classified as sedentary reduced from 34 to 25% (35 to 17%), ($\chi^2 = 1542$, d.f. = 1; $P < 0.001$). The percentage doing irregular moderate exercise reduced from 36 to 29% (36 to 22%), ($\chi^2 = 1213$, d.f. = 1; $P < 0.001$). The percentage doing regular moderate exercise increased from 29 to 45% (29 to 60%), ($\chi^2 = 1310$, d.f. = 1; $P < 0.001$). The percentage doing vigorous exercise increased from 3 to 6% (2 to 9%), ($\chi^2 = 967$, d.f. = 1; $P < 0.001$). Categorizing sedentary and irregular moderate exercisers as 'inactive' and regular moderate and vigorous exercisers as 'active', the percentage of people shifting from inactive to active was 19% (36%). The level of exercise change was roughly equivalent across men and women.

Changes in psychological well-being

There was a significant increase in overall psychological well-being ($t = 27$, d.f. = 3539; $P < 0.001$), and in perceptions of health ($t = 9$, d.f. = 3627; $P < 0.001$), energy levels ($t = 26$, d.f. = 3633; $P < 0.001$) and decrease in frequency of low mood ($t = 21$, d.f. = 3589; $P < 0.001$). There was also a significant decrease in reports of eating in response to negative emotions ($t = 19$, d.f. = 3567; $P < 0.001$). The percentage who reported eating in response to emotions 'often' or 'very

Table VI. Change in dietary and exercise behaviours in all evaluation participants and completers (means or percentages)

	Full sample (n = 3661)			Completers (n = 2112)		
	Baseline	Post-intervention	Mean change [95% CI] or % change ^a	Baseline	Post-intervention	Mean change [95% CI] or % change ^a
No. of servings of fruit and vegetables per day	2.86	3.61	0.75 [0.69–0.80]	3.1	4.4	1.3 [1.2–1.4]
Eating 5 or more portions fruit and vegetables per day (%)	20.9	33.9	13.0	24.2	46.9	22.7
Fried food intake per week	2.1	1.7	0.47 [0.41–0.52]	2.08	1.25	0.8 [0.7–0.9]
Eating fried food eaten less than once a week (%)	41.0	57.1	16.1	43.8	71.7	27.9
Consuming whole milk (%)	10.5	7.9	2.6	9.5	4.8	4.7
Meat eaters who cut visible fat off meat (%)	48.9	60.9	12.0	49.9	71.4	21.5
Snack intake per week	9.6	6.8	2.7 [2.5–2.9]	9.4	4.6	4.8 [4.5–5.0]
Starchy food as base of 2 meals per day (%)	51.7	55.3	3.6	52.4	58.5	6.1
Classified as ‘active’ (%)	29.9	46.8	16.9	30.2	62.2	32.0

^aAll changes are statistically significant at $P < 0.001$.

Table VII. Changes in psychological well-being and emotional eating on all evaluation participants and completers (means)

	Full sample (n = 3661)			Completers (n = 2112)		
	Baseline	Post-intervention	Mean change [95% CI] or % change ^a	Baseline	Post-intervention	Mean change [95% CI] or % change ^a
Psychological well-being	3.18	3.42	0.24 [0.22–0.26]	3.22	3.66	0.43 [0.41–0.46]
DEBQ Emotional Eating scale	3.57	3.35	0.22 [0.20–0.24]	3.54	3.15	0.39 [0.35–0.43]

^aAll changes are statistically significant at $P < 0.001$.

often’ decreased from 47 to 38% (46 to 30%) (see Table VII).

Predictors of behaviour change

Logistic regression was used to assess predictors of change in weight, exercise, snack intake, fried food intake and fruit and vegetable intake both among completers (see Table VIII) and among all evaluation participants assuming no change in non-responders (see Table IX). A median split of each dependent variable was used to give a binary outcome for the analyses which were respectively a loss of 3.2 kg, an increase of one portion of fruit

or vegetables, an increase of 105 min per week of exercise, any decrease in fried food intake and a reduction of three snacks per week. These analyses were repeated comparing ‘any positive change’ (either an increase or a decrease of any kind depending on the variable) versus ‘no change/negative change’, and this resulted in the same pattern of results. The median split for the analysis conducted on all participants was the same as the median split for any positive change versus no change/negative change.

The majority of measures used were demographic/descriptive but the measure of involvement

Table VIII. Participant characteristics associated with behaviour change (completers only) (odds ratios with confidence intervals)

	Weight loss	Reduced snack intake	Increased fruit and vegetable intake	Reduced fried food intake	Increased exercise
Age group					
<18–24 (<i>n</i> = 70)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
25–34 (<i>n</i> = 355)	1.66 [0.99–2.79]	1.05 [0.63–1.75]	2.17 ^a [1.30–3.63]	0.78 [0.47–1.30]	1.24 [0.73–2.08]
35–49 (<i>n</i> = 641)	1.28 [0.77–2.12]	0.86 [0.53–1.41]	2.08 ^a [1.26–3.41]	0.54 ^a [0.33–0.88]	0.98 [0.59–1.61]
50–64 (<i>n</i> = 517)	1.09 [0.65–1.81]	0.62 [0.38–1.02]	2.12 ^a [1.28–3.51]	0.52 ^a [0.32–0.86]	0.78 [0.47–1.31]
65+ (<i>n</i> = 147)	0.72 [0.41–1.28]	0.52 [0.30–0.90]	1.39 [0.79–2.42]	0.42 ^a [0.24–0.74]	0.56 [0.31–1.01]
Sex					
male (<i>n</i> = 239)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
female (<i>n</i> = 1491)	0.73 ^a [0.56–0.97]	0.98 [0.75–1.28]	1.18 [0.90–1.54]	0.60 ^a [0.46–0.79]	0.67 ^a [0.50–0.89]
Deprivation index (educational qualifications, car and home ownership)					
0 (<i>n</i> = 1033)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
1 (<i>n</i> = 434)	0.84 [0.68–1.05]	1.19 [0.96–1.47]	1.09 [0.88–1.35]	1.33 ^a [1.07–1.65]	1.04 [0.83–1.31]
2 (<i>n</i> = 206)	0.80 [0.59–1.07]	1.16 [0.87–1.56]	0.79 [0.59–1.06]	1.43 ^a [1.07–1.91]	0.97 [0.71–1.32]
3 (<i>n</i> = 57)	0.77 [0.46–1.29]	1.06 [0.63–1.77]	1.28 [0.75–2.19]	1.41 [0.84–2.36]	0.88 [0.51–1.51]
BMI					
normal: <25 (<i>n</i> = 161)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
overweight: 25–29.9 (<i>n</i> = 610)	2.91 ^a [2.02–4.19]	1.27 [0.91–1.76]	1.35 [0.97–1.88]	1.34 [0.94–1.91]	1.11 [0.78–1.58]
obese: 30+ (<i>n</i> = 959)	4.12 ^a [2.88–5.90]	1.54 ^a [1.11–2.12]	1.44 ^a [1.04–1.99]	1.83 ^a [1.30–2.57]	0.88 [0.63–1.25]
Involvement (continuous measure)	1.07 ^a [1.02–1.12]	1.02 [0.98–1.07]	1.08 ^a [1.04–1.14]	1.04 ^a [1.01–1.09]	1.05 ^a [1.01–1.10]

^aStatistically significant at at least $P < 0.05$.

in the first 5 weeks of the campaign was also used. The latter was analysed alongside the other demographic variables.

Predictors of change are shown in Table VIII. Amongst those returning the follow-up questionnaire, the multivariate analyses showed men were more likely than women to report changes in weight, exercise and fried food intake. Deprivation level was associated only with decreases in fried food intake. Baseline weight category predicted weight loss and positive changes in diet, with obese people reporting greater changes in these areas, but did not predict changes in exercise. However, it should be noted that the percent variance accounted for by these demographic variables was very small.

Involvement in the first 5 weeks of the campaign was a significant independent predictor of weight loss, increased fruit and vegetable intake, decreased

fried food intake, increased exercise but not of decreased snack intake. Separate examination of various aspects of involvement, i.e. watching or listening to the FFFF broadcasting versus buying the FFFF book or video, did not produce a substantially different pattern of results to that reported above.

As can be seen from Table IX, the analysis on all evaluation participants reduced the gender effect. Groups with higher levels of deprivation were less likely to report weight loss or exercise increases. Disappointingly, participants in the obese weight group did not report greater changes in diet and weight loss, and actually changed less in terms of exercise than normal weight groups.

Involvement in the first 5 weeks of the campaign was a significant independent predictor of weight loss, increased fruit and vegetable intake, decreased fried food intake, increased exercise and decreased

Table IX. Participant characteristics associated with behaviour change (all participants) (odds ratios with confidence intervals)

	Weight loss	Reduced snack intake	Increased fruit and vegetable intake	Reduced fried food intake	Increased exercise
Age group					
<18–24 (<i>n</i> = 219)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
25–34 (<i>n</i> = 917)	1.78 ^a [1.25–2.52]	1.57 ^a [1.11–2.22]	1.62 ^a [1.15–2.30]	1.23 [0.84–1.80]	1.61 ^a [1.13–2.30]
35–49 (<i>n</i> = 1328)	2.63 ^a [1.87–3.70]	2.06 ^a [1.47–2.89]	2.18 ^a [1.55–3.05]	1.30 [0.89–1.88]	2.34 ^a [1.66–3.32]
50–64 (<i>n</i> = 935)	3.47 ^a [2.45–4.92]	2.32 ^a [1.65–3.28]	2.51 ^a [1.78–3.56]	1.58 ^a [1.08–2.32]	2.55 ^a [1.79–3.64]
65+ (<i>n</i> = 258)	4.72 ^a [3.11–7.16]	2.53 ^a [1.68–3.82]	2.31 ^a [1.53–3.50]	1.63 ^a [1.04–2.57]	2.56 ^a [1.67–3.90]
Sex					
male (<i>n</i> = 488)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
female (<i>n</i> = 3161)	0.94 [0.76–1.14]	1.16 [0.94–1.42]	1.03 [0.84–1.27]	0.74 ^a [0.59–0.92]	0.90 [0.73–1.10]
Deprivation index (educational qualifications, car and home ownership)					
0 (<i>n</i> = 2000)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
1 (<i>n</i> = 988)	0.76 ^a [0.65–0.90]	0.94 [0.80–1.10]	0.92 [0.78–1.08]	1.04 [0.87–1.25]	0.78 ^a [0.66–0.92]
2 (<i>n</i> = 455)	0.90 [0.72–1.11]	1.05 [0.84–1.31]	0.97 [0.78–1.20]	1.21 [0.95–1.55]	0.76 ^a [0.61–0.96]
3 (<i>n</i> = 124)	0.88 [0.60–1.29]	0.97 [0.66–1.44]	1.20 [0.82–1.76]	1.18 [0.77–1.81]	0.79 [0.53–1.19]
BMI					
normal: <25 (<i>n</i> = 311)	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
overweight: 25–29.9 (<i>n</i> = 1202)	1.47 ^a [1.12–1.92]	1.11 [0.85–1.45]	1.05 [0.81–1.37]	1.18 [0.86–1.63]	0.97 [0.74–1.26]
obese: 30+ (<i>n</i> = 2079)	1.10 [0.85–1.42]	0.93 [0.72–1.20]	0.94 [0.72–1.21]	1.27 [0.93–1.72]	0.77 ^a [0.59–0.99]
Involvement (continuous measure)	1.06 ^a [1.03–1.10]	1.06 ^a [1.02–1.10]	1.06 ^a [1.02–1.10]	1.06 ^a [1.02–1.11]	1.07 ^a [1.03–1.11]

^aStatistically significant at $P < 0.05$ or less.

snack intake. Once again separate examination of various aspects of involvement, namely watching or listening to the FFFF broadcasting versus buying the FFFF book or video did not produce a different pattern of results to that reported above.

Discussion

The FFFF mass-media health campaign proved to be highly popular, generating tremendous interest nation-wide. An estimated 57% of the population were aware of the campaign (Wardle *et al.*, 2001) and 237 865 people requested a campaign pack within the first few weeks of the campaign. The response rate for the campaign, i.e. the percentage of viewers who telephoned the campaign line, was approximately double that normally generated by TV-based educational campaigns.

Compared with the population as a whole, those who sent off for a registration pack and agreed to

take part in the evaluation were more likely to be female and to have some educational qualifications which is consistent with research on other health campaigns (Malmgren and Andersson, 1986; Nice and Woodruff, 1990; Rissel, 1991). However, in contrast to other findings [e.g. (Smith *et al.*, 1995)] the FFFF campaign also recruited those with poor health practices, with most evaluation participants being overweight, eating too little fruit and vegetables, and doing little exercise compared to the British adult population [(Department of Health, 1998b; Health Education Authority, 1996; Cox *et al.*, 1993), respectively]. The BBC's aim to target the campaign towards those who were overweight or obese was generally successful in terms of those who registered with the campaign. The lower participation from men, those under 25 and people from lower socio-economic groups was disappointing, though not unexpected given typical BBC viewer profiles. Future campaigns may need

to use additional strategies to target these groups if they are to successfully engage them in this kind of mass-media approach to obesity prevention.

In the present study, conservative estimates of behaviour change were used, which assumed no change in weight, eating, activity and psychological well-being among evaluation participants who did not return the follow-up questionnaire. Despite using this more stringent measure, participation in the campaign was associated with significant changes in eating and activity patterns, and in weight. At follow-up, fruit and vegetable intake was higher, fatty food and snack intake was lower, there were increases in activity and positive changes in psychological well-being, and weight was reduced.

The predictors of change analysis among those completing the follow-up questionnaire showed that older, male and obese participants were slightly more likely to make lifestyle changes, although specific predictors of change varied across outcome variables. Whilst obese groups were more likely to report weight loss, reduced snack and fried food intake, and increased fruit and vegetable intake than normal weight groups they were no more likely to increase their exercise levels than normal weight groups, despite exercise being a crucial element in weight management. Furthermore, whilst obese groups were more likely to report the lifestyle changes mentioned, they were less likely to complete the follow-up questionnaire, suggesting that sustained participation in the FFFF campaign was lower in this group.

The predictors of change analysis conducted on all evaluation participants, which assumes no change in non-responders shows that, overall, obese people did not report greater behavioural changes than other weight groups. Future campaigns may need to offer additional elements in order to sustain participation among the most obese.

Men reported significantly higher lifestyle changes than women, notably in weight loss and exercise levels. However, only a small percentage of those joining the campaign were men, and those who did join and completed the follow-up questionnaire may have been a particularly

motivated group. Again, specifically targeted initiatives for men might be needed to increase their participation in campaigns of this kind.

It is of interest to note the gulf between the weight people expected to lose (7.8 kg) and the mean reported weight loss (2.3 kg). Nevertheless, approximately 75% of completing evaluation participants reported reductions in weight and increases in exercise, which is consistent with levels of reported change following other mass-media health campaigns, such as the 1992 BBC/HEA Health Show (Reid, 1996). Basing the estimate on all evaluation participants (which assumed no change in those who did not complete the follow-up questionnaire) suggests that approximately 40% of evaluation participants reduced their weight or increased their levels of exercise.

The assumption of no change in non-responders can be questioned. It is possible that non-responders made negative behaviour changes during the 6 months of the campaign and were actually less healthy at follow-up than they were at baseline. This possibility obviously cannot be ruled out, and it is worth noting that the estimates of behaviour change presented here, albeit conservative, may still over-estimate the effect on the total respondent population.

Whilst the reported changes in weight and exercise following the FFFF campaign are encouraging, the findings must be evaluated cautiously. Levels of lifestyle change were not evaluated within a control community so no firm inferences can be made that the lifestyle changes came as a result of the FFFF campaign and would not have occurred anyway. Health promotion interventions have often shown that changes in intervention groups are matched by changes in control groups, possibly because of secular trends or diffusion of the campaign message through the community (Fortmann *et al.*, 1993; Roe *et al.*, 1997). However, it seems unlikely that the secular trend during the period of the FFFF campaign was towards overall weight loss. Jeffery, for example, has argued that changes in secular trends in obesity seem particularly hard to reverse in comparison with changes in smoking, cholesterol and blood pressure

(Jeffery, 1993), and current reports indicate that levels of obesity are escalating. A more serious limitation in the present study was that the measures used were self-report and there was no independent verification that the participants actually made the changes. The changes may simply reflect participants reporting what they thought they should be doing rather than what they actually were doing. Baseline reports of eating and activity behaviour probably under-estimate snack intake and over-estimate physical activity levels [(Poppitt *et al.*, 1998; Sims *et al.*, 1999), respectively]; however, the extent to which self-report may have been consistently biased across time or more biased at follow-up is unclear. Previous dieting behaviour and current dietary restraint have both been associated with under-reporting of dietary intake (Lafay *et al.*, 1997). This raises the possibility of under-reporting of intake at follow-up being accentuated compared with baseline. In addition, the baseline measures were retrospective reports of pre-campaign behaviour and may have been subject to memory biases that the follow-up questions were not. Finally, the changes reported were over the course of 6 months and therefore only indicate short-term lifestyle changes. For assessing successful changes in obesity management initiatives, it would be optimal to include a long-term follow-up spanning years rather than months.

Despite these limitations, the results of this evaluation provide evidence that mass-media campaigns have the potential to reduce obesity levels, at least in the short-term, and at least among people who elect to participate in such campaigns. Future campaigns should attempt to build on this by following recommendations for mass-media health campaigns discussed by Contento *et al.*, for example, by broadcasting the campaign message over years rather than weeks or months to increase the likelihood of long-term change (Contento *et al.*, 1995). Also, as noted in the introduction, those health campaigns which have demonstrated population-level changes following mass-media campaigns are ones which have included other elements in addition to mass-media programming. Future mass-media health campaigns should form

strong links with local resources, such as community and health centres offering weight management and healthy lifestyle programmes, to enhance the likelihood that such campaigns have a wide-spread effect.

In summary, the results of the current study suggest that the FFFF campaign was successful in recruiting people with weight problems to the campaign, and stimulating them towards making short-term dietary and exercise changes. Although the validity of the self-reported claims of dietary and activity change cannot be established, if even a fraction of those who reported positive changes altered their lifestyle, then the campaign will have made an important contribution to the nation's health.

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