Original Article

Are the benefits of the 'Healthy Start' food support scheme sustained at three months postpartum? Results from the Sheffield 'before and after' study

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Abstract

Early results examining nutritional behaviour of Caucasian, English-speaking, postpartum women living in Sheffield, who were beneficiaries or eligible for the Welfare Food Scheme (WFS) or the Healthy Start (HS) scheme, suggested significant between-groups differences. The aim of this study was to examine whether differences observed at 4 weeks postpartum were sustained over time. Eighty-six WFS and 64 HS participants were recruited at baseline and, thereafter, 53 WFS and 33 HS participants at week 8, and 47 WFS and 39 HS participants at week 12. Dietary intakes were assessed by an interviewer-administered, semi-quantified food frequency questionnaire. At 4 weeks, HS women had higher energy intakes compared to WFS women, (9.7 MJ and 8.1 MJ, respectively). Differences were also sustained at 8 weeks, (8.8 MJ and 7.2 MJ) and 12 weeks (9.4 MJ and 7.6 MJ) for the HS and WFS participants, respectively. Within-groups, energy and most of nutrient intakes did not change appreciably over time. Consumption of fruit and vegetables at baseline, were significantly higher ($P = 0.023$) for participants under the HS scheme (3.4 portions) compared to WFS participants (2.7 portions). Differences were sustained over time as HS women reported consuming 4.1 and 3.7 portions/day respectively at 8 and 12 weeks, as opposed to 2.8 and 2.7 portions/day reported by WFS women. The study findings provided evidence of the potential effectiveness of the HS scheme in a population subgroup at risk of dietary deficiencies. Early findings could provide a useful snapshot of the diet of such mobile population and should be further exploited.

Keywords: Healthy Start, postpartum nutrition, food support scheme, effectiveness.

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Introduction

The Healthy Start (HS) food support scheme in the UK replaced the long-standing Welfare Food Scheme (WFS) in November 2006. It provides monetary vouchers that can be exchanged for fresh fruit and vegetables as well as liquid cow's milk and infant formula to pregnant women, nursing mothers and children under 4 years of age in families receiving

qualifying benefits and to all pregnant women less than 18 years of age. Qualifying benefits include income support, income-based Jobs Seekers Allowances, and Child Tax Credit with an income of £16 040 or less (2009/10). HS is also designed to ensure that pregnant women and families participating in the scheme have the opportunity to access good quality information and advice about health and lifestyle advice, including stopping smoking, diet in pregnancy,

breastfeeding, weaning and the roles of milk, fresh fruit, vegetables and vitamins in the diet (Department of Health 2002).

To date, no national evaluation of the impact of the new scheme on the nutritional status of beneficiaries has been carried out. Similarly, no national evaluation of the WFS scheme has ever been carried out. In April 2009, the Department of Health published the findings of an equality impact assessment covering policy development, consultation, and implementation. The report suggested that around 78% of those eligible for the food support benefit were claiming it, but uptake varied between hospital trusts and countries. In addition, it was estimated that less than 1% of those entitled to free vitamin supplements through the new scheme obtained them regularly (Department of Health 2009).

The HS project in Sheffield is a 'before-and-after' study investigating maternal and infant nutrition practices before and after the introduction of the HS scheme. We have previously reported dietary intakes and eating patterns of low-income, Caucasian pregnant and postpartum women in Sheffield, before and after the introduction of the new food benefit (Ford *et al.* 2009). Dietary intakes of the pregnant women were assessed at 20 weeks of pregnancy and of the postpartum women at 4 weeks postpartum using a semi-quantified food frequency questionnaire (FFQ). The study findings suggested that pregnant and postpartum women under the HS scheme increased their food consumption, and a larger proportion of them than the WFS scheme met the reference values for calcium, folate, iron and vitamin C. In addition, HS women consumed significantly a higher number of portions of fruit and vegetables per day. Observed differences remained significant after controlling for potential confounders including education and age and were mainly attributed to the increased fre-

quency of consumption of the FFQ food items by HS women. It should be noted, however, that in both pregnant and postpartum WFS and HS women, a significant proportion of participants did not meet the reference values for iron and folate and to a lesser extent for calcium and vitamin C.

The aim of the present paper is to report the results of the longer term follow-up on the dietary intakes of the postpartum women, before and after the introduction of HS. In order to establish whether between-groups differences observed at baseline were sustained over time, dietary intakes assessed at 8 and 12 weeks postpartum were evaluated against intakes obtained at baseline (4 weeks postpartum). Within-groups repeatability of baseline intakes was also examined.

Materials and methods

Study design

A before-after-study design was used to compare the nutritional behaviour of postpartum women who were either beneficiaries of, or eligible for WFS (Phase 1) to postpartum women who were either beneficiaries of, or eligible for HS (Phase 2). Sample size calculations were not performed as it was not possible to identify potential study participants in advance, and thus, the sample size was opportunistic.

Settings and study participants

Eligibility criteria included; Caucasian ethnic origin (white-British), English speaking, living in Sheffield, having a live healthy baby, free of any nutrition-related pre-existing medical condition and recipient of, or eligible for food-support benefit. Potential eligibility for food-support benefit was defined by

Key messages

- Positive observed influences at 4 weeks were sustained at 3 months postpartum.
- Postpartum HS women significantly increased their daily intakes of energy, iron, calcium, folate and vitamin C and were more likely to achieve the five-a-day target for fruit and vegetables.
- Health professionals should advise HS women about improving their nutrient intake without the risk of excess energy intakes.

Fig. 1. Recruitment and data collection timeline of postpartum participants before (phase 1) and after (phase 2) the introduction of 'Healthy Start'.

maternal age, subject's postcodes, maternal and partner's occupational status. Postcodes were used to identify subjects living in deprived electoral wards of Sheffield using the Index of Multiple Deprivation (Noble *et al.* 2004).

Postpartum women were initially approached at the postnatal wards at the Jessop Wing, Royal Hallamshire Hospital in Sheffield. Participants were formally introduced to the study by trained researchers. Following a study overview and provision of an explanatory information leaflet, potential participants were asked for their permission to be telephoned by a researcher before 4 weeks postpartum to determine if they would participate in the study. Participants were visited and interviewed at home by a trained interviewer at 4 weeks postpartum (baseline data). In addition, measurements of dietary intakes were obtained at 8 and 12 weeks postpartum over the phone (Fig. 1).

This study was performed as a Service Evaluation with the approval of the North Sheffield Local Research Ethics Office. Postpartum women were given an explanatory information leaflet in advance before recruitment. Participation was based on oral consent.

Dietary assessment

Information on the anthropometric, socio-demographic and behavioural characteristics of study participants was obtained via face-to-face, interviewer-administered, closed-question questionnaire interviews. Body Mass Index (BMI) (kg m^{-2}) calculations were based on self-reported heights and pre-pregnancy weights. Potential confounding factors for observed differences were identified and examined for unequal distribution. These included BMI,

maternal age, educational status, smoking status, use of pre- and post-conceptional folic acid supplements, parity, partner's employment status, and maternal employment status.

Dietary intakes were determined using a validated, interviewer-administered, semi-quantified FFQ, adapted from the FFQ used by Rogers *et al.* (1998). The FFQ, validated for use in pregnant (Mouratidou *et al.* 2006) and postpartum women (Mouratidou *et al.* 2009, unpublished) in Sheffield asks about the frequency of consumption of 62 questions, 40 of which are about the frequency of consumption of meat, poultry, fish, seafood, common vegetables and fruits, breakfast cereals and confectionery and uses standard portion sizes. There are also detailed questions about the type and amount of fat, bread, alcohol and milk consumed. Frequency options include: never or rarely, once a fortnight, one to three times a week, four to seven times a week and more than once a day.

Energy and nutrient intakes were calculated from foods only and did not include any provided from supplements. QBUILER was used to analyse daily intakes of energy, nutrients and food items obtained from the FFQ (Tinuviel Software, Anglesey, UK). Participants reporting unfeasibly low or high energy intakes (<3.1 and >20.9 MJ/day) were removed from the dataset prior to the analysis. Calculations of misreporting at baseline were conducted and are described in detail elsewhere (Ford *et al.* 2009).

Statistical methods

The STATISTICAL PACKAGE FOR SOCIAL SCIENCES version 15.0 (SPSS Inc., Chicago, IL, USA) was used to analyse the data. Differences in the anthropometrical characteristics were assessed using an unpaired t

test. Standard cross-tabulated tables were conducted in order to compare categorical variables, and chi-square was used to test the significance of the relationships. All statistical tests and corresponding P values were two-sided and $P < 0.05$ was considered statistically significant.

Data obtained from the repeated FFQs are presented as means with 95% confidence intervals (95% CI) for energy, and selected macro- and micronutrients. Nutrient intake estimates did not meet the assumptions of normal distribution. Therefore the non-parametric Mann-Whitney U test was used to assess between-group differences in crude intakes at baseline (week 4). Univariate analysis was used to control for the possible effects of confounding factors on observed differences at baseline. Within-group net changes for energy and specified nutrients from baseline to weeks 8 and 12 were calculated (follow-up_{intake} – baseline_{intake}) and are presented with 95% CI.

The weekly frequency of consumption of selected food items (portions/week) obtained from the repeated FFQs is also presented as means with 95% CI. In order to obtain weekly frequencies, response values for each relevant FFQ food item were grouped. For this purpose, 'more than once a day' became 14 times a week, '4 to 7 times a week' became 5.5 times a week and so on. Mann-Whitney U test was used to assess between-group differences in weekly frequency at baseline (week 4). Within-group net changes for number of portions per week from baseline to weeks 8 and 12 were calculated (follow-up_{portions/week} – baseline_{portions/week}) and are presented with 95% CI.

Results

The postpartum study recruited 150 women (86 WFS and 64 HS) at baseline. Four postpartum WFS women were removed from the dataset because of incomplete dietary data. Two WFS and two HS postpartum women were excluded from the analysis because of unfeasible reported high energy intakes. No participant excluded because of unfeasible reported low energy intakes. In total, 80 WFS and 62 HS postpartum women were included in the baseline analysis. At first follow-up (week 8), 53 WFS and 33 HS partici-

pants provided complete data and were included in the first follow up analysis. At second follow-up (week 12), 47 WFS and 39 HS participants provided complete data and were included in the second follow-up analysis. No participant was excluded from the first and second follow-up analysis because of incomplete data or of unfeasible reported high or low energy intakes.

From baseline to first follow-up, 11 WFS and 17 HS interviews – and from baseline to second follow-up, 6 WFS interviews – were missed mainly because the researchers were unable to establish telephone contact with participants or because participants were unable to provide dietary information at time of contact. For these participants, researchers tried to obtain information on two or three occasions; however, participants reported that they did not have the time, asked to call back, etc. Therefore, researchers were unable to obtain data within the specified time frame. Missed interviews with participants were not considered in the calculation of dropout rates. Most of those participants provided information in one of the following follow-ups (either themselves or their babies). Dropout rates at 8 weeks were 19% and 20% for the WFS and HS women, respectively. Dropout rates at 12 weeks were 21% for the WFS and 17% for the HS women.

In both groups, characteristics of those who responded to one of the follow-up interviews did not differ to those dropping out at weeks 8 or 12. The main reasons given included the participant's time constraints, no interest for further participation and disconnected phone lines.

Table 1 presents the anthropometric, socio-demographic and behavioural characteristics of WFS and HS postpartum women in the study. HS women had a significantly higher self-reported pre-pregnancy BMI ($P = 0.003$), and were significantly younger ($P = 0.021$) than WFS women.

Dietary intakes

Table 2 presents unadjusted mean daily intakes (95% CI) of energy and selected macro- and micronutrients at baseline (4 weeks) and at first and second follow-up of participants under the WFS and the HS scheme.

Table 1. Anthropometrical, socio-demographic and behavioural characteristics of postpartum participants under the WFS ($n = 80$) and HS scheme ($n = 62$)

	WFS	HS	<i>P</i> value*
Body mass index (kg m^{-2})	$22.3 \pm 4.8^{\dagger}$	$25.4 \pm 4.9^{\ddagger}$	0.003
Age (years)	$25 \pm 7^{\S}$	$22 \pm 6^{\S}$	0.021
Receipt of food support (%)			0.077
Yes	71	84	
No	29	16	
Educational attainment (%)			0.222
5 GCSE's** or more	75	66	
No qualification ^{††}	25	34	
Self-reported smoking status (%)			0.137
Non-smoker	49	56	
Current smoker	51	44	
Pre-conceptional folic acid suppl. (%)			0.901
Yes	8	8	
No	92	92	
Post-conceptional folic acid suppl. (%)			0.077
Yes	71	84	
No	29	16	
Breastfeeding at 4 weeks (%)			0.186
Yes	30	20	
No	70	80	

*As tested by unpaired *t* test for anthropometrical variables and by Chi-square test for categorical variables (two-tailed). [†] $n = 59$. [‡] $n = 48$. [§] $n = 78$. [¶] $n = 61$. **GCSE's: General Certificate of Secondary Education. A general educational examination taken at age 16. ^{††}Includes: current students, no qualifications.

At baseline, HS women had significantly ($P < 0.05$) higher intakes of all key nutrients compared to WFS women with the exception of alcohol ($P > 0.05$). The association still existed following control for the effect of possible confounders discussed in the dietary assessment section.

Between-groups, energy intakes were repeatedly higher for the HS women across the three observations. Similarly, HS women reported higher intakes of all nutrients examined at all three time points, with the exception of alcohol. For instance, at baseline, HS women had repeatedly higher calcium intakes compared to WFS women (1027 mg and 774 mg), first follow-up (1030 mg and 672 mg) and second follow-up (1131 mg and 706 mg), respectively.

Within-groups, energy and most of nutrient intakes did not change appreciably at first and second follow-up, and were either similar or lower to baseline intakes (Table 3). In the WFS group, greater changes were observed for macronutrients between baseline and first follow-up and for micronutrients between baseline and second follow-up. In the HS group, mean

changes observed at first follow-up were greater for energy, carbohydrate, total fat and vitamin C, exceptions being protein and alcohol, which were higher at first follow-up for the HS women. Although energy intakes of the HS group were highest at baseline, noticeable increases in intakes of iron, zinc, folate and alcohol were observed at second follow-up. For example, folate intakes increased from 272 μg (baseline) to 324 μg (second follow-up) per day and iron intakes from 13 mg (baseline) to 15 mg (second follow-up) per day.

Table 4 shows between-groups estimated mean changes in weekly frequency of consumption of selected food items at first and second follow-up compared to baseline for the two groups. At baseline, mean intakes of all items but one (carrots) was higher for the HS group. Not all differences were appreciable and not all reached statistical significance. Also, between-groups no appreciable increases or decreases in weekly consumption were noted between baseline and follow ups and those observed included rather similar food items. The HS

Table 2. Unadjusted mean intakes of key nutrients at baseline and at 2 and 3 months follow-up of postpartum participants under the WFS and the HS scheme

	Baseline*		<i>P</i> [†]	First follow-up [‡]		Second follow-up [§]	
	WFS	HS		WFS	HS	WFS	HS
	Mean (95% CI)	Mean (95% CI)		Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Energy (MJ)	8.1 (7.6, 8.5)	9.7 (8.9, 10.4)	0.001	7.2 (6.7, 7.6)	8.8 (7.8, 9.5)	7.6 (6.9, 8.2)	9.4 (8.2, 10.2)
Protein (g)	66 (62, 71)	78 (72, 84)	0.002	60 (56, 65)	82 (72, 91)	63 (57, 69)	83 (73, 93)
Total fat (g)	83 (77, 89)	101 (93, 109)	0.0001	72 (66, 77)	89 (78, 99)	75 (68, 83)	95 (82, 109)
Carbohydrate (g)	240 (225, 255)	292 (264, 319)	0.006	218 (203, 232)	256 (225, 287)	234 (211, 255)	281 (246, 316)
Fibre (g)	12 (11, 13)	15 (13, 17)	0.011	12 (11, 14)	15 (13, 17)	12 (11, 13)	16 (13, 19)
Calcium (mg)	774 (709, 837)	1027 (917, 1135)	0.0001	672 (614, 730)	1030 (875, 1185)	706 (635, 775)	1131 (943, 1319)
Iron (mg)	9.8 (9.1, 10)	13 (11, 14)	0.003	9.6 (8.6, 11)	13 (11, 15)	9 (8.3, 10.4)	15 (12, 17)
Zinc (mg)	7.0 (6.5, 7.5)	8.9 (8.0, 9.7)	0.001	6.6 (6.1, 7.1)	8.6 (7.5, 9.6)	6.8 (6.1, 7.4)	9.8 (8.5, 11)
Total Folate (µg)	230 (214, 246)	272 (246, 297)	0.023	218 (197, 239)	277 (244, 310)	215 (195, 234)	324 (278, 369)
Vitamin C (mg)	63 (56, 69)	90 (79, 101)	0.001	62 (54, 71)	77 (64, 90)	63 (53, 72)	93 (76, 110)
Alcohol (g)	3.8 (1.8, 5.9)	0.83 (0.18, 1.5)	0.013	3.5 (1.6, 5.4)	2.4 (0.13, 4.8)	3.5 (1.8, 5.2)	2.5 (0.36, 4.5)

*WFS = 80 HS = 62. [†]Between group difference at baseline were tested by Mann-Whitney U test (2-tailed). [‡]WFS = 53 HS = 33. [§]WFS = 47 HS = 39.

Table 3. Unadjusted mean change of key nutrients at 2 and 3 months follow-up compared to baseline of postpartum participants under the WFS and the HS scheme

	First follow-up*		Second follow-up [†]	
	WFS	HS	WFS	HS
	Mean change (95% CI)	Mean change (95% CI)	Mean change (95% CI)	Mean change (95% CI)
Energy (MJ)	-1.1 (-1.6, -0.5)	-1.2 (-1.9, -0.4)	-0.8 (-1.3, -0.2)	-0.1 (-0.6, 0.4)
Protein (g)	-9.2 (-14, -4.2)	1.6 (-4.9, 8.2)	-6.0 (-10.5, -1.6)	2.4 (-5.1, 9.9)
Carbohydrate (g)	-22 (-39, -4)	-42 (-74, -12)	-21 (-40, -3)	-3.2 (-36, 30)
Total Fat (g)	-15 (-22, -8.5)	-13 (-22, -5.2)	-11 (-18, -3.6)	-5.6 (-16, 5.2)
Fibre (g)	-0.23 (-1.2, 0.82)	-1.3 (-4, 1.2)	-1.3 (-2.4, -0.13)	0.64 (-2.0, 3.3)
Calcium (mg)	-151 (240, -62)	-44 (-207, 119)	-111 (-186, -36)	32 (-110, 175)
Iron (mg)	-0.35 (-1.3, 0.62)	-0.28 (-2.3, 1.7)	-0.93 (-1.8, -0.06)	1.3 (-1.4, 4.0)
Zinc (mg)	-0.72 (-1.4, -0.08)	-0.48 (-1.4, 0.44)	-0.64 (-1.2, -0.04)	0.53 (-0.63, 1.8)
Total Folate (µg)	-18 (-37, 1.5)	-11 (-44, 21)	-30 (-46, -15)	42 (5.7, 78)
Vitamin C (mg)	-4.0 (-11, 3.5)	-15 (-28, -1.1)	-7.2 (-15, 1.2)	-1.2 (-18, 15)
Alcohol (g)	-0.93 (-3.7, 1.9)	1.6 (0.13, 3.0)	0.11 (-1.5, 1.7)	1.9 (-0.19, 3.9)

*WFS = 53 HS = 33. [†]WFS = 47 HS = 39.

Table 4. Estimated mean changes in weekly frequency of consumption (portions/week) of selected food items at 2 and 3 months follow-up compared to baseline estimates based on the FFQs

	Baseline*		<i>P</i> [†]	First follow-up [‡]		Second follow-up [§]	
	WFS	HS		WFS	HS	WFS	HS
	Mean (95% CI)	Mean (95% CI)		Mean change (95% CI)	Mean change (95% CI)	Mean change (95% CI)	Mean change (95% CI)
Cheese	2.81 (2.29, 3.34)	3.83 (2.90, 4.46)	0.060	-0.34 (-1.01, 0.34)	-0.89 (-1.81, 0.03)	0.14 (-0.44, 0.71)	0.30 (-1.21, 1.82)
Chips (oven, homemade, fries)	2.19 (1.79, 2.59)	3.09 (2.4, 3.77)	0.018	0.12 (-0.42, 0.67)	-0.73 (-1.24, -0.21)	0.17 (-0.40, 0.75)	-0.41 (-1.05, 0.23)
Crisps	3.53 (2.67, 4.38)	5.07 (3.78, 6.36)	0.048	-0.94 (-2.01, 0.13)	-0.53 (-2.08, 1.03)	-0.86 (-2.05, 0.33)	-0.93 (-2.45, 0.58)
Green leafy vegetables	1.63 (1.30, 1.95)	2.01 (1.62, 2.40)	0.130	0.04 (-0.4, 0.47)	-0.05 (-0.77, 0.68)	0.08 (-0.41, 0.57)	-0.16 (-0.72, 0.41)
Other green vegetables (cauliflower, runner beans)	2.15 (1.81, 2.49)	2.25 (1.83, 2.68)	0.708	-0.28 (-0.75, 0.19)	0.26 (-0.68, 1.19)	-0.43 (-0.88, 0.03)	0.33 (-0.45, 1.11)
Carrots	2.78 (2.07, 3.49)	2.66 (2.25, 3.07)	0.789	-0.60 (-1.54, 0.34)	-0.14 (-1.07, 0.81)	-0.17 (-1.23, 0.89)	-0.14 (-0.82, 0.53)
Fresh fruit	3.47 (2.44, 4.49)	6.57 (5.16, 7.69)	0.001	2.20 (0.67, 3.73)	1.26 (-0.80, 3.32)	0.64 (-0.94, 2.22)	0.61 (-1.33, 2.55)
Fruit drinks from concentrate	6.30 (4.92, 7.67)	10.09 (8.60, 1.58)	0.001	0.08 (-2.12, 2.28)	-0.38 (-2.47, 1.72)	2.33 (0.25, 4.41)	-1.34 (-3.22, 0.54)
Fruit juice (not from concentrate)	2.15 (1.47, 2.82)	4.99 (3.64, 6.34)	0.001	0.14 (-0.86, 1.15)	0.77 (-0.95, 2.50)	0.78 (-0.49, 2.06)	-0.07 (-2.12, 1.99)
Other breakfast cereals (cornflakes, rice crispies)	2.11 (1.50, 2.71)	2.48 (1.50, 3.45)	0.526	-0.62 (-1.34, 0.10)	0.08 (-0.75, 0.91)	-0.95 (-2.05, 0.15)	1.80 (0.40, 3.20)
Chocolate bars	1.22 (1.71, 2.95)	2.49 (2.34, 4.38)	0.004	-0.84 (-1.68, 0.01)	-1.85 (-3.20, -0.49)	0.02 (-0.99, 1.04)	-0.11 (-1.54, 1.34)
Biscuits	2.56 (1.80, 3.31)	4.21 (3.00, 5.42)	0.023	-0.29 (-1.40, 0.82)	-0.61 (-2.89, 1.68)	-0.10 (-0.86, 0.66)	-0.92 (-3.22, 1.38)
Puddings	1.61 (1.09, 2.12)	2.55 (1.63, 3.46)	0.061	-0.13 (-1.03, 0.77)	-0.97 (-2.65, 0.72)	-0.06 (-0.82, 0.71)	-0.09 (-1.79, 1.60)
Milk in breakfast cereals	3.28 (2.65, 3.90)	5.86 (4.50, 7.22)	0.001	0.40 (-0.80, 1.60)	1.21 (-1.25, 3.67)	-0.39 (-1.40, 0.64)	0.57 (-1.80, 2.94)
Milk on its own	2.36 (1.58, 3.14)	4.99 (3.62, 6.36)	0.001	-0.82 (-1.73, 0.10)	-0.77 (-2.53, 0.99)	-0.53 (-1.51, 0.45)	-0.70 (-2.17, 0.78)
Milk in milky drinks	0.60 (0.29, 0.91)	1.72 (0.88, 2.56)	0.014	-0.22 (-0.61, 0.18)	-0.68 (-2.39, 1.03)	0.16 (-0.34, 0.66)	0.47 (-0.96, 1.91)

*WFS = 80 HS = 62. [†]Between group difference at baseline were tested by Mann-Whitney U test (2-tailed). [‡]WFS = 53 HS = 33. [§]WFS = 47 HS = 39.

group was associated with an increased consumption of fruits, other green vegetables (cauliflower, runner beans), other breakfast cereals (cornflakes, rice crispies) and milk in breakfast cereals from baseline to follow-ups.

Figure 2 displays the mean number of portions of fruit and vegetables reported to be consumed by the WFS and HS groups at baseline, and at first and second follow-up. At baseline, participants under the

HS scheme consumed significantly a higher number of portions per day ($P = 0.023$) compared to WFS participants. It is apparent from the figure that observed differences at baseline were sustained into the follow up observations. HS women reported consuming 4.1 (first follow-up) and 3.7 (second follow-up) portions/day as opposed to 2.8 (first follow-up) and 2.7 (second follow-up) portions/day reported by WFS women.

Fig. 2. Mean number of portions of fruit and vegetables consumed per day by WFS and HS women at baseline (4 weeks), 8 and 12 weeks postpartum.

Discussion

The HS food support scheme has potentially important public health implications. Therefore, it is of interest to evaluate its potential influence on the health status of the target population. The aim of the analysis was to assess whether differences observed at 4 weeks postpartum between WFS and HS women, were sustained into 12 weeks postpartum (Ford *et al.* 2009). The results were based on a relatively homogenous sample of women with rather similar characteristics.

Between-groups energy intakes were higher for the HS women across the three observations. At baseline, mean energy and key nutrient intakes were significantly higher in the HS women even after controlling for potential confounders (Ford *et al.* 2009). It appeared that HS participants had on average an extra 1.5 to 1.6 MJ per day at each time point, in comparison to WFS participants, which in a way reflected higher observed intakes of all examined nutrients but alcohol. Differences were attributed to an increased frequency of consumption of FFQ food items at each time point by the HS women.

As we saw, within-groups energy and nutrient intakes did not alter noticeably from baseline to follow ups as reflected both in the means and 95% CIs of within-group change. Within-group changes were rather similar or lower to baseline intakes with the exception of noticeable increases in iron, zinc, folate and alcohol intakes of HS women at second follow-up. Increased weekly consumption of fruits, other green vegetables, other breakfast cereals and milk

in breakfast cereals over time by the group, might explain some of these noticeable increases.

With respect to changes in weekly consumption of food items between- and within-groups, no appreciable increases or decreases were noted apart from those discussed above. An important observation relates to the higher reported number of portions of fruit and vegetables per day by the HS participants compared to WFS, which was sustained into the follow up observations. It appears that to some extent, vouchers given to beneficiaries under the new scheme influenced their fruit and vegetables consumption at individual and group level.

In the UK, few studies have described the effects of nationwide food schemes on sub-groups, usually amongst children. Evidence suggests a positive but waning effect of participation in such schemes. For instance, Wells & Nelson (2005) found that participation in the National School Fruit Scheme (NSFS) produced a short-term increase in fruit intakes of schoolchildren aged 4 to 6 years. Fogarty *et al.* (2007) also reported that participation in the NSFS was effective in increasing fruit intakes across the range of socio-economic deprivation. These increases however, failed to be sustained once participation in the scheme ended. In addition, the findings of a non-randomised controlled trial of infant and primary schools in the north of England, evaluating the impact of the School Fruit and Vegetable Scheme suggested a small, positive but waning impact over time (Ransley *et al.* 2007).

There is a limited number of studies reporting on the effectiveness of nutritional stand-alone commu-

nity interventions in relation to dietary and health outcomes. A systematic review conducted by D'Souza *et al.* (2006), highlighted the gap in evidence base, urged for further research on deficiencies of women of childbearing age in the UK and called for a robust national evaluation of the HS scheme. Currently, this is the only research with available data on maternal and infant feeding practices before and after the introduction of HS, which could be exploited to inform practice.

The design, measurements and sample size of this study should be taken into consideration when interpreting study findings. Because the new food-support programme was introduced nationwide to a fixed timetable, there was no opportunity to perform any type of randomised controlled study or include any prospective design for equivalent comparison groups. In this knowledge we conducted a 'before and after' cross-sectional study. Steps taken to minimize potential bias are described in detail elsewhere (Ford *et al.* 2009).

The authors are aware that a more comprehensive picture of the women's diets might have been achieved by the use of a more precise method. The use of FFQs for dietary and dietary change assessment is often been criticized in favour of biomarkers usage or other dietary assessments methods considered to be more accurate, i.e. weighted food records. Taking into account the characteristics of the target population, however, usage of other methods would have been less practical because of their association with a large respondent burden, low response rate and unsuitability for non-high literate groups (Willett 1998). In addition, our previous research has shown that the FFQ used in our study gave useful estimates of dietary intakes in pregnant (Mouratidou *et al.* 2006) and post-partum (Mouratidou *et al.* 2009, unpublished) women by demonstrating fair reproducibility and validity for the majority of nutrients examined.

Other similarly less accurate methods of approximation like 24 hour dietary recalls have been used to justify dietary change as a result of national policies in the UK as discussed earlier. In the context of intervention effects, FFQs have been used in a variety of settings and population (Takashashi *et al.* 2003; Mayer-Davis *et al.* 2004). For instance, Kristal *et al.*

(1994) reported that the FFQ used in their study was as responsive as multiple diet records in assessing change in two randomised dietary intervention trials aiming reduction of fat intakes. Similarly, Thompson *et al.* (2003) concluded that both the FFQs and recalls captured adequately differences in dietary change in a multicentre, randomised intervention trial among breast cancer survivors and called for use of multimode approaches when possible in dietary interventions.

The results should be interpreted in the context of them being based on crude dietary intakes and the degree of misreporting likely to have affected observed relations. The authors did not consider appropriate adjusting for energy intake because it might have masked the main outcome of this study which refers to alterations in energy intakes (Willett 1998).

Another limitation of our study is related to the unbalanced model of observations used. Thirty-three WFS and 22 HS participants provided data on all three time points. Given the relatively small number of participants who provided complete data, it was decided to conduct and report the analysis of an unbalanced but bigger in size model of observations. The authors did conduct analysis on completed observations, however, and very similar outcomes to those reported in this paper were observed (data not shown). As confirmed by our experience, recruitment and retention of participants in a cohort study is particularly challenging even when anticipated; especially of those participants from low-income communities (Anderson 2007). Given that a high proportion of our sample lived in the most deprived electoral wards of Sheffield, it is therefore not surprising that we have encountered difficulties in retaining participants and increased drop out rates. This coupled with considerable subject burden of repeated questionnaires (participants and their babies) are likely to have contributed to the smaller sample sizes.

In the short term, the question whether participation in the HS scheme contributes to healthier eating patterns is confirmed as positive. Although the goal was reached by the HS participants combined at first and second follow-up, the extent of its significance for

public health depends on the true magnitude of the changes and its sustainability of the effect. Therefore further research in the UK is required to address repeatability of the current study findings. Evidence on cancer and changes in diet and physical activity, suggests that small and sustained changes at individual level can translate to considerable changes at population level, should these changes are distributed across population (Colditz *et al.* 2000).

As already mentioned, HS participants had approximately an extra 1.6 MJ per day at each time point in comparison to WFS participants. Therefore, attention also needs to be drawn at the possible link of food-support programs to obesity pandemic, reinforcing greater emphasis on the need for vigorous evidence and thorough evaluation of the HS scheme. In the USA, concerns have been raised that obesity is a by-product of food support programmes such as WIC and Food Stamps, and enables participants to consume more energy than they otherwise would. A meta-analysis of food-support programmes showed that non-elderly adult women, who account for 28% of the caseload, are the only group of food-support recipients for whom multiple studies show a link between food-support receipt and an elevated BMI and obesity (Ver Ploeg 2008). Generalizability of participation results, however, should be cautious and within the context of the varied elements of food support programmes, i.e. educational, behavioural, and the study designs and methodologies used when comparing results.

This research adds evidence to the gap underlining the need for such programmes and their potential in contributing to improved dietary intakes and eating habits. A lack of large sample size for reasons discussed earlier prevented the authors from investigating whether the group effect in terms of size was same or differed across distribution. Therefore, further studies are needed to assess not only repeatability of findings, sustainability and magnitude of change but also effect size by distribution. It is also important to examine the effects of vouchers endorsed with healthy advice and food environment on dietary choices and awareness of beneficiaries. Engaging with hard to reach groups is a challenge however, and should be anticipated in early stages.

The authors appreciate that adequate time should be allowed from the viewpoint of effects on public health. Given the necessity of evidence-based policies however, early findings could provide a snapshot of the situation and should be further exploited. Despite reservations regarding study design and optimal dietary assessment, findings presented here provide evidence on the potential effectiveness of the HS scheme in a population subgroup at risk of dietary deficiencies.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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