Has the UK Healthy Start voucher scheme been associated with an increased fruit and vegetable intake amongst target families? Analysis of Health Survey for England data, 2001–2014

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Abstract

Background

Healthy Start (HS) is a UK government programme, introduced in 2006, providing vouchers to pregnant women or families with children aged <4 who are in receipt of certain benefits. Vouchers can be exchanged for fruit and vegetables (F&V), milk or infant formula. We sought to identify any association between HS and F&V intake.

Methods

We analysed repeated cross-sectional data from the Health Survey for England. Study participants were classified into one of four groups: one HS-eligible group and three control groups, meeting only the income or demographic or no eligibility criterion. Outcome measures were mean F&V intake, and the proportions of participants consuming ≥3 and ≥1 portion/day. Outcomes were compared across the four groups over four time periods: 2001-2003, 2004-2006, 2007-2009 and 2010-2014. Regression analyses examined whether F&V intake among HS-eligible participants had a significantly different rate of change from those in control groups.

Results

The change in mean F&V consumption over time was similar in HS-eligible adults and children to that of control groups. Likewise, the change in odds of consuming ≥3 or ≥1 portion of F&V/day over time was similar among HS-eligible participants and control groups.

Conclusion

This study found that during the period 2001-03 to 2010-14, F&V consumption among adults and children in households deemed eligible for HS changed similarly to that of other adults and children. Potential explanations include that vouchers may have been spent on milk or infant formula, or that vouchers helped protect F&V consumption in low income households.

Key words: Diet, Nutrition, Child health, Health Behaviour, Health Policy

What is already known on this subject?

Qualitative and small quantitative studies to date suggest that Healthy Start vouchers enable participants to eat more fruit and vegetables. Previously, no large national study had been conducted to assess the change in fruit and vegetable intake over time among Healthy Start recipients relative to control groups.

What this study adds?

Using survey data from large, nationally-representative samples, Healthy Start eligible families did not increase their fruit and vegetable intake more than other families following the introduction of Healthy Start in 2006 and up to 2014.

INTRODUCTION

The World Health Organisation recommends a minimum daily intake of 400g of fruit and vegetables (F&V) to reduce disease risk.[1] Recently, meta-analysis of 16 prospective cohort studies demonstrated that greater F&V consumption is associated with lower mortality from all causes, cardiovascular disease, and cancer.[2] This has also been demonstrated using nationally representative data from the Health Survey for England (HSE).[3] Good nutrition in pregnancy and early life may have lifelong consequences.[4, 5] Governments have taken various approaches to try to increase population consumption of F&V, most commonly health education or health promotion messaging, for example the UK '5-a-Day' campaign, introduced in 2003.

F&V intake in high-income countries is associated with socio-economic status, with those in deprived areas and with lower incomes consuming fewer portions.[6] Where there are inequalities in health and health behaviour, relying on health promotion messaging and health education can widen these inequalities.[7] Other approaches may be needed to increase F&V consumption across all socio-economic groups.[8] Food subsidy programmes are one way to reduce financial barriers to healthy diets. Both the US and the UK have longstanding food subsidy programmes: the Special Supplemental Nutrition Programme for Women, Infants and Children (WIC) and the Healthy Start (HS) programme which replaced the Welfare Food Scheme in 2006, respectively.

The HS programme is a means-tested scheme providing vouchers to eligible parents to spend with local retailers including supermarkets, pharmacies, greengrocers, corner shops, market stall and milk floats or vans, redeemable on:

- plain cow's milk;
- infant formula milk that can be used from birth and is based on cow's milk; and
- plain, fresh or frozen F&V.

The HS programme differs from the Welfare Food Scheme that it replaced, by allowing vouchers to be spent on F&V, where the Welfare Food Scheme was specifically for cow's milk or infant formula only.

Pregnant women (after 10 weeks) and children over one and under four years old are entitled to one £3.10 voucher per week, and children under one year old are entitled to two £3.10 vouchers (£6.20) per week, if the family receives specified benefit payments. In addition, all pregnant women under 18 qualify (see appendix A for details of eligibility). The claim rate is around 80% of those eligible; 90% of the vouchers are redeemed.[9] HS also provides eligible women and their families with coupons that can be exchanged for free vitamins, although this aspect of the programme is more complex and there are concerns about low uptake of the vitamins.[10]

There is some evidence that food subsidy programmes can have a positive effect on diet, although information on children is lacking. A systematic review, which synthesised evidence from 14 studies of food subsidy programmes, concluded that food subsidy programmes successfully increase the intake of targeted foods, particularly in pregnant women, by 10-20%.[11] Eleven of these studies were from the US and nine of them examined WIC, while two were from the UK. The UK studies included a randomised controlled trial of 190 women, which found that provision of a voucher which could be exchanged for fruit juice increased fruit juice consumption,[12] and a non-randomised trial of food supplementation conducted in the 1930s which demonstrated that this improved child growth outcomes.[13]

HS itself has been evaluated in a small-scale study which found that 160 women receiving HS food vouchers ate significantly more F&V per day than 176 women on the Welfare Food scheme,[14] however data from the Diet And Nutrition Survey of Infants and young Children (DANSIC) showed that F&V intake was lower among HS recipients than the general population of the same age.[15] A large qualitative study with HS stakeholders reported that HS is perceived to provide a nutritional safety net for low income families.[10] Our study sought to identify any association between the introduction of HS and F&V intake among eligible families compared with that of control groups, using data from the HSE.

We sought to determine whether the introduction of the HS scheme was associated with a greater increase in F&V intake among families deemed eligible for HS than among other households, using data from the HSE.

METHODS

Participants and data

This was an analysis of repeated cross-sectional data from the HSE. This annual survey uses a multistage, stratified design to sample a new, nationally-representative random sample of the free-living population of adults and children in England each year. Survey methods have been described elsewhere.[16]

Each year from 2001 until 2011, information was collected about F&V consumption for HSE participants aged five years or over.[17] Participants were asked again in 2013, and in 2014 for children only.

Participants (or their parents, for children aged 5-12) are asked to recall, using common measures e.g. tablespoons, slices, their F&V consumption on the previous day (a 24h period) including salads; fresh, frozen and tinned F&V; and dishes made mainly from fruits or vegetables. In addition, pulses, fruit juices and dried fruits can contribute a maximum of one portion each in line with DH guidance.[18, 19] From this information, the equivalent total number of portions of F&V consumed is calculated.

HSE participants are asked about income and state benefits received, and about all members of the household, including those aged under 5 years. Using this information, study participants were classified into one of four groups: one intervention group and three control groups. Group one comprised all individuals living in households eligible to receive HS vouchers (‘G1-HS’). See appendix A for HS eligibility criteria and corresponding HSE data. Group two comprised all individuals living in households with qualifying children or pregnant women but not receiving qualifying benefits (‘G2-Young’). Group three comprised all individuals living in households receiving qualifying benefits but no qualifying children or pregnant women (‘G3-Benefits’). Group four comprised remaining participants (‘G4-

Others'). All individuals living in a single household were assumed to be part of a family for HS eligibility purposes.

Individuals were excluded from analysis if they were aged 50 or over, since older adults tend to consume more F&V than younger adults and are likely to be over-represented in groups three and four. Children from the boost sample (additional children surveyed in specific years to increase sample size and with no parents invited to participate, other than to answer questions about their household and children) and individuals with no data for F&V intake (21 adults and 17 children) were also excluded.

Statistical analysis

Analyses were performed using IBM SPSS v21 and Stata v13. Outcome measures were mean F&V intake, and the proportions of participants consuming ≥3 and ≥1 portion/day. Thresholds lower than the target 5-a-day were chosen because the impact of an additional portion of F&V is greatest at zero.[3] Weighted survey data were used to adjust for non-response bias.

Analyses were run separately for children (aged 5-15 years) and adults (aged 16-49 years). Outcomes were compared across the four groups over four time periods: 2001-2003, 2004-2006, 2007-2009 and 2010-2014. The periods were selected to separate any effects from the initiation of the 5-a-day campaign in late 2003 with the introduction of HS in late 2006; and to determine whether any effects were short-lived or sustained. Potential confounders were adjusted for, using stepwise multivariable regression. These were: age-group (5-10, 11-15, 16-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49), sex, area deprivation (quintile of Index of Multiple Deprivation), ethnicity (White, Black, Asian, Mixed, Other), as well as different, but related, socio-economic measures: household income (quintile of equivalised household income), and educational attainment of adults (degree or equivalent, qualification below a degree, aged under 22 with no degree yet, no qualification). Multiple linear regression was used where the outcome was mean F&V intake, and multiple logistic regression was used for remaining outcomes. Interaction terms between time-period and eligibility group were included in regression analyses to examine whether F&V intake among G1-HS had a significantly different rate of

change from those in the three control groups. Where there was no evidence of interaction, analysis was re-run excluding interaction terms to create the final models. Assumptions for validity of linear and logistic regression were tested. In the adult sample, the mean F&V was 3.2 (SE 2.7), with a median of 3, and range of 0-40. For children mean was 3.1 (SE 2.2), median 2.8, range 0-49.

Ethical approval

Research ethics approval was obtained prior to each HSE survey. Since this paper details the secondary analysis of existing data, additional ethical approval was not required.

RESULTS

Table 1 shows the (unweighted) characteristics of participants by HS eligibility group. Overall, 3.3% of participants (3.4% of the 62,874 adults and 3.1% of the 21,404 children) were classified as eligible for HS (G1-HS); 16.0% of adults and 9.0% of children were in group two (G2-Young); 8.8% of adults and 16.4% of children were in group three (G3-Benefits), and 71.8% of adults and 71.6% of children were in group 4 (G4-Other)

Groups one and three households were poorer, less likely to be white, and adults were less likely to have a qualification than those in groups two and four. Group one households included more children on average than other households, including group three, and had a younger average age of adults and children.

Table 1. Characteristics of study participants

		G1-HS	G2-Young	G3-Benefits	G4-Others	TOTAL
Participants	N	2763	11 994	9078	60 443	84 278
Adults	N	2109	10 078	5560	45 127	62 874
Male adults	%	25.1	42.6	36.0	46.3	44.1
Adults / household	mean	1.5	2.1	1.7	2.2	2.1
Children	N	654	1916	3518	15 316	21 404
Male children	%	48.2	49.7	50.5	50.5	50.4
Children / household	mean	1.8	1.6	1.1	0.7	0.9
Age [a]						
5-10	%	18.1	13.5	21.3	12.5	13.8
11-15	%	5.5	2.5	17.4	12.8	11.6
16-19	%	7.4	2.0	8.1	8.0	7.2
20-24	%	20.1	6.7	4.9	8.4	8.1
25-29	%	18.7	15.7	6.4	8.4	9.5
30-34	%	14.4	26.8	8.9	8.8	11.5
35-39	%	9.2	21.7	11.1	11.6	12.9
40-44	%	4.1	8.8	11.2	14.9	13.3
45-49	%	2.4	2.3	10.7	14.6	12.0
Mean age adults	years	28.3	32.7	34.1	34.5	34.0
Mean age children	years	8.2	7.5	10.0	10.4	10.0
Ethnicity						
Proportion White	%	77.3	82.7	80.0	87.1	85.4
Equivalised household income (quintile)						
Lowest quintile	N (%)	1928 (75)	612 (5.9)	6205 (74.5)	4563 (9.1)	13 308 (18.6)
Second lowest	N (%)	505 (19.7)	1822 (17.7)	1731 (20.8)	8300 (16.5)	12 358 (17.3)
Middle quintile	N (%)	84 (3.3)	2529 (24.6)	288 (3.5)	11 149 (22.1)	14 050 (19.6)
Second highest	N (%)	31 (1.2)	2706 (26.3)	62 (0.7)	13 166 (26.1)	15 965 (22.3)
Highest quintile	N (%)	21 (0.8)	2632 (25.6)	48 (0.6)	13 209 (26.2)	15 910 (22.2)
Education						
No qualification	N (%)	472 (22.4)	706 (7.0)	1564 (28.1)	3892 (8.6)	6634 (10.6)
Below degree	N (%)	1097 (52.0)	5602 (55.6)	2686 (48.3)	23 046 (51.1)	32 431 (51.6)
Degree	N (%)	126 (6.0)	3284 (32.6)	371 (6.7)	11 334 (25.1)	15 115 (24.0)
Aged < 22 with no degree (yet)	N (%)	410 (19.4)	450 (4.5)	918 (16.5)	6713 (14.9)	8491 (13.5)
Not known	N (%)	4 (0.2)	36 (0.4)	21 (0.4)	142 (0.3)	203 (0.3)
Portions of F&V						

Adults 16-49	Mean (SD)	2.6 (2.5)	3.5 (2.7)	2.5 (2.4)	3.3 (2.7)	3.2 (2.7)
	Median (range)	2 (0-21)	3 (0-23)	2 (0-28)	3 (0-40)	3 (0-40)
Children 5-15	Mean (SD)	2.9 (2.1)	3.2 (2.1)	2.8 (2.1)	3.2 (2.3)	3.1 (2.2)
	Median (range)	2.5 (0-13)	3 (0-18)	2.3 (0-26)	3 (0-49)	2.8 (0-49)

[a] No information was collected in HSE on F&V consumption by children aged <5yr.

Mean fruit and vegetable intake by adults and children

After weighting for non-responses, unadjusted adult mean F&V intake differed significantly by HS eligibility group ($p<0.001$). Adults in G2-Young had the highest overall mean intake (3.7 portions/day) followed by adults in G4-Others (3.5 portions/day), adults in G1-HS (2.8 portions/day) and adults in G3-Benefits (2.6 portions/day). Unadjusted adult mean F&V intake also varied by time period ($p<0.001$), increasing slightly from 3.3 portions/day in 2001-2003 to 3.5 in 2004-06, 2007-09 and 2010-14.

The linear regression (adjusted) model for adults' mean daily F&V consumption including terms for interactions between time period and HS eligibility group found no evidence of interaction ($p=0.457$), i.e. changes in mean F&V consumption over time were similar in G1-HS and control group adults. The final regression model (Table 2) found that adult mean F&V consumption was significantly higher among women, with increasing age, among non-white groups, those living in less deprived areas, in higher income households, and among those with educational qualifications, compared with those with none. There was also a significant increase in the mean number of portions consumed per day from 2001-3 to 2004-6, and a significant decrease between 2004-6 and 2010-14.

Figure 1 shows the modelled mean portions of F&V for adults in the different eligibility groups, for the reference group (male, in the youngest age group, white, living in the most deprived quintile of areas, with the lowest income and no qualifications: the lowest consumers of F&V).

Table 2. Multiple linear regression of mean number of portions of fruit and vegetables consumed per day among adult participants.

	coefficient	p value	95% confidence interval	
HS eligibility group				
Group 1 (HS-eligible)	0.00			
Group 2 (young families no benefits)	0.33	0.00	0.17	0.48
Group 3 (benefits no young children)	-0.24	0.00	-0.39	-0.09
Group 4 (all others)	0.19	0.01	0.04	0.33
Sex				
Male	0.00			
Female	0.37	0.00	0.33	0.41
Age group				
16-24	0.00			
20-24	0.14	0.01	0.03	0.26
25-29	0.26	0.00	0.11	0.41
30-34	0.53	0.00	0.38	0.69
35-39	0.62	0.00	0.47	0.77
40-44	0.65	0.00	0.51	0.80
45-49	0.79	0.00	0.64	0.94
Ethnicity				
white	0.00			
black	0.49	0.00	0.34	0.64
Asian	0.89	0.00	0.79	1.00
mixed	0.59	0.00	0.38	0.80
other/na	0.65	0.00	0.44	0.86
Deprivation quintile (IMD)*				
most deprived	0.00			
2nd most deprived	0.20	0.00	0.13	0.28
middle deprivation	0.24	0.00	0.16	0.32
2nd least deprived	0.33	0.00	0.24	0.41
least deprived	0.36	0.00	0.28	0.45
Equivalised household income quintile				
lowest income	0.00			
2nd lowest income	-0.01	0.90	-0.10	0.09
middle income	0.08	0.10	-0.02	0.17
2nd highest income	0.21	0.00	0.12	0.31
highest income	0.43	0.00	0.33	0.53
Education				
no qualifications	0.00			
qualifications below degree	0.38	0.00	0.31	0.46
degree	1.19	0.00	1.10	1.28
aged <22 with no degree (yet)	0.45	0.00	0.30	0.59
Time period				
2001-3	-0.22	0.00	-0.29	-0.15
2004-6	0.00			
2007-9	-0.04	0.25	-0.12	0.03

2010-14	-0.10	0.02	-0.18	-0.02
intercept	1.65	0.00	1.45	1.86

* Index of Multiple Deprivation

Figure 1: Mean adjusted portions fruit and vegetable consumed among adults by Healthy Start eligibility category and time period.

Unadjusted child mean F&V intake differed by HS eligibility group: children in G2-Young and G4-Others had the highest overall mean intake (both 3.0 portions/day) followed by children in G1-HS (2.7 portions/day) and children in G3-Benefits (2.6 portions/day). Unadjusted child mean F&V intake also varied by time period, increasing from 2.5 portions/day in 2001-2003 to 3.2 in 2010-14.

The linear regression (adjusted) model for children's mean daily F&V consumption including terms for interactions between time period and HS eligibility group found no evidence of interaction (p=0.374) i.e. the change in mean F&V consumption over time was similar in children in G1-HS and control groups. The final regression model (table 3) found that children's mean daily F&V consumption was significantly higher among girls, non-white groups, those living in less deprived areas, and in households in the highest two income quintiles. This model also found a significant increase in the mean number of portions consumed per day over time.

Figure 2 shows the modelled mean portions of F&V for children in the different eligibility groups, for a reference group (male, aged 5-10, white, living in the most deprived 5th of areas and lowest income households: the lowest consumers of F&V).

Table 3. Multiple linear regression of mean number of portions of fruit and vegetables consumed per day among child participants.

	coefficient	p value	95% confidence interval	
HS eligibility group				
eligible	0.00			
young families	0.17	0.09	-0.03	0.37
benefits	0.00	0.99	-0.19	0.19
others	0.15	0.11	-0.03	0.34
Sex				
Male	0.00			
Female	0.17	0.00	0.11	0.23
Age group				
5-10	0.00			
11-15	-0.03	0.29	-0.10	0.03
Ethnicity				
white	0.00			
black	0.64	0.00	0.44	0.84
Asian	0.60	0.00	0.47	0.74
mixed	0.42	0.00	0.23	0.60
other/na	0.95	0.00	0.56	1.35
Deprivation quintile (IMD)				
most deprived	0.00			
2nd most deprived	0.24	0.00	0.13	0.34
middle deprivation	0.26	0.00	0.15	0.38
2nd least deprived	0.41	0.00	0.29	0.52
least deprived	0.48	0.00	0.36	0.59
Equivalised household income quintile				
lowest income	0.00			
2nd lowest income	0.03	0.58	-0.08	0.15
middle income	0.09	0.12	-0.03	0.21
2nd highest income	0.22	0.00	0.08	0.36
highest income	0.57	0.00	0.42	0.72
Time period				
2001-3	-0.44	0.00	-0.53	-0.34
2004-6	0.00			
2007-9	0.11	0.04	0.01	0.22
2010-14	0.14	0.01	0.04	0.24
intercept	2.29	0.00	2.10	2.48

* Index of Multiple Deprivation

Figure 2. Mean adjusted portions fruit and vegetable consumed among children by Healthy Start eligibility category and time period.

***Data points for G3-Benfits are the same as G1-HS.**

Proportion of adults and children eating at least 1 or at least 3 portions of F&V

We found no evidence of any interaction between time period and HS eligibility group where the outcome variable was the proportion of adults consuming at least three portions F&V/day (p=0.463), or the proportion of adults consuming at least one portion of F&V/day (p=0.101) (full results in appendix B). That is, the change in odds of consuming ≥3 or ≥1 portion of F&V/day over time was similar among adults in G1-HS and in control groups. The overall odds (irrespective of HS group) of eating ≥3 and ≥1 portion/day in 2004-6 were significantly higher than in 2001-03 and in 2010-14. Irrespective of time period, adults in G2-Young and G4-Others had a higher odds for eating both ≥3 and ≥1 portion/day than those in G1-HS. Those in G3-Benefits had lower odds of consuming both ≥3 and ≥1 portion/day than those in G1-HS.

There was no evidence of an interaction between time period and HS eligibility group where the outcome variables were the proportions of children consuming ≥3 portions F&V/day (p=0468) or ≥1 portion F&V/day (p=0.560). That is, the change in odds of consuming ≥3 or ≥1 portion of F&V/day over time was similar among children in HS eligible households and control groups. There was a significant increase in the odds of children eating ≥3 and ≥1 portion/day from 2001-3 to 2004-6. There was a further significant increase in the odds of children eating ≥1 portion/day from 2004-06 to 2007-09. Children in G1-HS had similar odds of consuming ≥3 or ≥1 portion/day compared to those in control groups.

DISCUSSION

This study found that during the period 2001-03 to 2010-14, F&V consumption among adults and children living in households eligible for HS changed in a similar way to that of other adults and children. This differs from previous qualitative and quantitative studies, which have found increases in F&V consumption associated with HS vouchers. For example, a study comparing F&V intake in 160 women

receiving HS vouchers with that of 176 women receiving the welfare food scheme tokens found significantly greater F&V intake among HS participants. [14] That increase was maintained at eight and 12 weeks.[20] That study differs from ours, being smaller and conducted in a single city around the time of the introduction of HS. A study of 266 UK households with children and receiving benefits found that those assessed as being eligible for HS vouchers consumed 15% more F&V than others.[21] In qualitative studies, HS recipients have largely reported that the vouchers have increased the quantity and range of F&V eaten by them and their families.[10, 22]

This study has two main strengths. First, it is a large study, using nationally-representative data from 84,278 HSE participants (including 2,763 people living in households deemed eligible to receive HS). Secondly, and unlike some previous studies,[14, 23, 24], this study grouped participants according to deemed eligibility for HS, rather than whether participants were receiving HS vouchers. This study therefore examines the intention to treat effect, testing the effectiveness of the HS programme in supporting F&V consumption among target groups, rather than the narrower measure of efficacy of the vouchers for those receiving them. As appendix A shows, HSE data enables very close matching with HS eligibility criteria. Using comparable ages and time frames, 4% of HSE households were deemed eligible for HS, compared with 3% of households in England. It is possible that insufficiently detailed benefit data in the HSE may have resulted in a small number of HSE participants who should have been categorised as G2-Young being incorrectly classified as G1-HS. However, this would not alter our conclusions, given that none of the relevant findings were of borderline significance.

There are also a number of limitations to this study. These limitations exemplify some of the challenges of conducting a large-scale evaluation of a national policy using data collected for other purposes when primary data collection is not feasible. First, F&V data in HSE is only available for participants aged five years and above. Given that HS vouchers are provided for children aged up to four years (as well as pregnant women), the inability of this study to measure changes in F&V consumption among this group may be important. By assuming that F&V purchased from HS vouchers were shared among all members of the household, we were able to measure F&V consumption among all household members as a proxy for intake

among young children. However, it is possible that a greater share of purchased F&V is consumed by those directly eligible for vouchers. Qualitative research found that whilst parents largely reported sharing vouchers amongst the family, some women reported compartmentalising their shopping to use vouchers for specific children. [22] Given that they are below school age, children aged under four may be more likely to eat more meals and snacks within the home, and therefore more of the household F&V than older children. Whilst 24-hour recall has some inherent bias as a dietary assessment tool, it is considered suitable for large surveys,[25] and comparison with the UK National Diet and Nutrition Survey suggests that recalled F&V intake in HSE is accurate.[26]

There are some differences in group characteristics not accounted for in regression analyses, e.g. the number of children per household. However, since analysis compared changes in F&V intake over time between groups, whose characteristics would remain broadly similar year to year, the impact of between-group differences is believed to be negligible. Correlation exists between adult and child F&V intake (within households), however, as HS vouchers are used by families, it is not possible to separate the correlation due to being in the same household from any possible impact of HS.

A further assumption was that HS vouchers were used at least partly for F&V. HS vouchers can provide sufficient funds to enable households to purchase enough F&V to have a measurable effect on intake. However, it is possible that households were opting to spend at least some of the vouchers on the other eligible food items (milk or formula), particularly given the Welfare Food Scheme that HS replaced, provided vouchers only for use to purchase milk or formula, which might have led to recipients viewing them as “milk vouchers”. Women who fed their babies using formula reported spending all or nearly all of their vouchers on formula. [10, 15, 22] There may therefore be differential effects on diets of families purchasing infant formula compared with breastfeeding women, given that formula costs more than the value of vouchers. [10] However, restricting the sample to exclude families with children aged under 1 didn’t change the overall findings: while F&V varied by eligibility and year, there was no significant interaction, indicating that there wasn’t a significantly different rate of change for the HS eligible group compared with the others.

Some households receiving HS vouchers, even those choosing to spend them wholly on F&V, may not purchase additional F&V, but rather substitute other sources of income with vouchers, freeing up household budget for other expenses.[10] Whilst not increasing F&V intake, this substitution may be a positive outcome for a family with many demands on a limited budget and may enable these households to maintain F&V consumption. Conversely, it has been demonstrated that people may compartmentalise spending, mentally allocating some income to specific products, even where there are no restrictions on elements of income.[27] Some HS participants reported that the vouchers acted as a reminder of the importance of a healthy diet, and that they bought less F&V once they stopped receiving vouchers.[28] In addition, participants reported that the vouchers enabled them to buy a wider range and quality of vegetables, something that may not result in a measurable increase in quantity of F&V consumed but is arguably a positive outcome.[10, 28] Research in the US found that F&V purchases increased following the addition of F&V vouchers to the WIC, and that substitution effects were relatively small.[24]

A further finding of our analysis was that between 2001-03 and 2004-06 adults and children demonstrated a significant increase in mean F&V consumption and proportions consuming ≥3 and ≥1 portion/day, in agreement with the findings of the Family Food Survey.[29] This correlates with the introduction of the Government's 5-a-Day campaign in 2003. We also observed a 0.1 portion/day decrease in adult adjusted mean F&V intake between 2004-06 and 2010-14, which coincides with the 2008-09 UK recession. As an observational study, our finding cannot provide evidence of a causal link between F&V intake and either 5-a-Day or the recession.

Some participants allocated to G1-HS may have recently become eligible but not yet received HS vouchers. Furthermore, participants who had previously received vouchers but were no longer eligible (and either aged out of the scheme of ceased to receive eligible benefits) may have maintained their increased F&V habits which would be a positive impact of HS undetectable through this study.

In conclusion, whilst this study did not demonstrate an increased F&V consumption among target families relative to control groups, it does provide evidence that the

change in F&V intake in this vulnerable group over time remained similar to that of other groups.

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Contributorship statement

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Co-wrote paper: RS, AM, OO, JM
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FIGURE LEGENDS

Figure 1: Mean adjusted portions fruit and vegetable consumed among adults by Healthy Start eligibility category and time period.

Figure 2. Mean adjusted portions fruit and vegetable consumed among children by Healthy Start eligibility category and time period.