




BMC Public Health

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Research article | [Open Access](#) | [Published: 30 March 2020](#)

Impact of a health marketing campaign on sugars intake by children aged 5–11 years and parental views on reducing children's consumption

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[BMC Public Health](#) **20**, Article number: 331 (2020)

1902 Accesses | **3** Citations | **17** Altmetric | [Metrics](#)

Abstract

Background

The association between Free Sugars intake and non-communicable diseases such as obesity and dental caries is well documented and several countries are taking measures to reduce sugars intakes. Public Health England (PHE) instigated a range of approaches to reduce sugars, including a national health marketing campaign (Sugar Smart). The campaign aimed to raise awareness of the amount of sugars in foods and drinks and to encourage parents

to reduce their children's intake. The aim of this study was to determine whether the campaign was effective in altering dietary behaviour, by assessing any impact of the campaign on sugars intake among children aged 5–11 years. Parental perceptions of the campaign and barriers to reducing sugars intake were also explored.

Methods

Parents of 873 children aged 5–11 years, identified from an existing PHE database, were invited to take part. Dietary information was collected online using Intake24 before, during, and at 1, 10 and 12 months following the campaign. Change in sugars intake was assessed using mixed effects linear regression models. One-to-one telephone interviews were conducted with a purposive sample of parents to explore perceptions of the campaign and identify barriers and facilitators to reducing children's sugars intake.

Results

Completion rates for dietary assessment ranged from 61 to 72% across the follow up time points.

Qualitative telephone interviews were conducted with 20 parents. Total sugars intake decreased on average by ~ 6.2 g/day (SD 43.8) at peak campaign and the percentage of energy from total sugars significantly decreased immediately and 1 year post campaign. The percentage of energy from Free Sugars significantly decreased across all time points with the exception of the long term follow up at 12-

months post campaign. The percentage of energy intake from total fat increased. Parents expressed a willingness to reduce sugars intakes, however, identified barriers including time constraints, the normalisation of sugary treats, and confusing information.

Conclusions

A health marketing campaign had a positive impact in reducing sugars intake but reductions in sugars were not sustained. Parents want to reduce their child's sugars intake but societal barriers and confusion over which sources of sugars to avoid hamper efforts to change.

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Background

The association between Free Sugars intake and non-communicable diseases (NCDs) such as obesity and dental caries has been well documented [1,2,3,4] and there is a wealth of evidence suggesting current sugars intakes are exceeding recommendations in many countries [5,6,7]. Free Sugars include all mono- and di-saccharides added to foods by manufacturer, cook or consumer, plus those sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates¹ [8].

In 2015 the World Health Organisation issued a strong recommendation that Free Sugars intakes by

individuals should not exceed 10% of total energy intake, with a conditional recommendation to reduce Free Sugars intake to below 5% of total energy intakes [9]. Following this, the Scientific Advisory Committee on Nutrition (SACN) recommended that at a population level, the intake of Free Sugars should not exceed 5% of total energy intake in the UK [10]. Likewise, in the US Department of Agriculture recommend that Americans should consume less than 10% of calories as added sugars [11] (which includes syrups and honey, but excludes those Free Sugars in fruit juices and fruit juice concentrates).

Data from the UK National Diet and Nutrition Survey (NDNS) indicate that intake of Free Sugars by all age groups exceeds the recommendation [12]. Boys and girls aged 4–10 years received an average of 13.6 and 13.4% (respectively) of their food energy from Free Sugars. Only 3% of boys and 1% of girls had intakes below or equal to 5% total energy. In the US more than 13% of energy is provided by added sugars [11], and only 33% of children aged 2–19 years meet the dietary guideline recommendation [6].

Considerable action, including upstream and downstream preventive measures is therefore required to bring sugars intake in line with current recommendations. Following a review of the evidence for action on sugar reduction, including what drives excessive sugars intake, PHE proposed a broad range of measures to reduce sugars intake [13]. Actions included upstream approaches, such as the introduction of a structured, transparent

programme of sugar reduction and a wider reformulation programme. With all sectors of the food industry challenged to reduce the overall sugars content of key foods that contribute to intakes of children by around 20% by 2020 through product reformulation to cut the sugars levels in products; a reduction in portion size; and/or a shift in consumer purchasing towards lower/no-added sugars products and introducing a levy on sugar-sweetened beverages [13]. However, if instigated without first building public support such measures can attract criticism for interfering unduly with personal choice [14,15,16].

Downstream approaches aim to inform the public, change opinion and build support for change. PHE proposed to reduce sugars intake by raising awareness of the amount of sugars in children's diets in England in comparison with government recommendations, problems around high amounts of sugars in the diet and to encourage families to take action to reduce intakes [13]. In 2016, PHE launched the Change4Life Sugar Smart Campaign [17]. This health marketing campaign used TV, radio, a digital product and advertising to: raise awareness of the high levels of sugar consumed by children and the associated health harms; raise awareness of the amount of added sugars in everyday foods and drinks; and to encourage parents to cut down the amount of such sugars their children consumed.

Sugar Smart packs were distributed to primary age children via schools, which provided families with information about guidelines for sugars intake and

practical information to help them reduce sugars in their children's diet. A free Sugar Smart app was available to download, which enabled parents to see how much sugars was contained in everyday foods and drinks (depicted in sugar cubes) by scanning the barcode on pack.

The main purpose of health marketing campaigns such as the Change4Life Sugar Smart Campaign is to raise awareness, change attitudes and ultimately help shift the behaviour of the population. Information on the impact on attitudes and on dietary behaviour is therefore important in determining if health marketing is an effective means of helping to reduce a populations sugars consumption.

The aim of the present study was to assess any impact of the Change4Life Sugar Smart Campaign on the dietary behaviour of children aged 5–11 years whose parents had shown an interest in previous Change4Life campaigns. A second aim was to explore any impact in awareness around sugars and to identify any potential barriers and facilitators to reducing sugars intake.

The objectives were:

- to measure the total intake of dietary sugars (type, amount g/day, percent contribution to total energy intake, and dietary sources) in a population of children aged 5–11 years (girls and boys from a range of socioeconomic, ethnic and family backgrounds);

- to assess any change in sugars intake during and after the Change4Life campaign;
- to obtain qualitative data from a sub-sample of parents about their understanding of the campaign messages, knowledge of sugars and any perceived barriers and facilitators to reducing their child's sugar intake.

Methods

Participant recruitment

In liaison with 'Kantar Public UK' and PHE, participants were recruited from families that had registered with the PHE Change4Life database. In order to detect a 10% change in sugars intake by both boys and girls with 90% power at the 0.05 alpha, the target sample size was 289 boys and 256 girls (a total of 545 with equal numbers from two socio-economic groups (A, B, C1 and C2, D, E [18])), from a range of ethnic backgrounds (White, Asian/Asian British, Black/African/Caribbean/Black British, mixed/multiple ethnic, other ethnic group) and geographic areas in England. To account for attrition (a potential loss to follow up of 42%, informed by the National Diet and Nutrition Survey (NDNS) [19]) a target sample size of 775 (411 boys and 364 girls) was set.

Kantar Public UK sent a recruitment email to parents including an online screening questionnaire to determine those who were eligible to take part in the study (i.e. the parent/guardian had at least one child

aged 5–11 years). Eligible participants received an electronic participant information, consent (and child assent) documents which parents/ guardians were asked to complete online. Ethical approval was obtained from Newcastle University Ethics Committee (application number 01030).

The sugar smart campaign

The Change4Life Sugar Smart campaign was launched on January 4th 2016. TV, billboard and digital advertising ran for 6 weeks to support the campaign. A Sugar Smart app was available for parents to download free of charge (Fig. [1](#)). The app enabled users to scan barcodes on food and drink packaging to find out how many grams of total sugars were contained in the product; depicted in sugar cubes, to help consumers visualise the amount. Sugar Smart packs were distributed to primary school children, which provided children and parents with further information and tools to help them cut down on sugars. The pack informed on thresholds for sugars intake and a guide indicating the sugars content of popular foods and drinks, practical guidance on how to reduce sugars intake, and information about the Sugar Smart app. Further details about the campaign can be found at the Change4Life website [[20](#)].

Fig. 1

Screen shots from the Change4Life Sugar Smart app. **a** Barcode scanner on the Sugar Smart app. **b** Amount of total sugars contained in the food depicted in sugar cubes. **c** Information available on the app regarding maximum daily amounts of sugar for children

Dietary data collection using Intake24

Information on the dietary intake of each participating child was collected over 2 weekend days at five time points; baseline (2nd and 3rd January 2016), peak campaign (30th and 31st January 2016), immediately post campaign (27th and 28th February 2016), to identify any short-term effects of the campaign, and 10-months (20th and 21st November 2016) and 12-months post campaign (29th and 30th December 2016), to identify any

sustained effects. To control for seasonal fluctuations in intakes (due to the timing of the campaign around the Christmas/New Year period), the long term follow up was exactly 12 months from baseline. Data were also collected at 10-months post campaign (outside the Christmas period).

Parents/guardians were asked to report their child's dietary intake using an online self-completed 24-h dietary recall system 'Intake24' (<https://intake24.co.uk>) [21]. Parents/ guardians were assigned a unique username and password for Intake24 and were asked to log on and report everything their child had to eat and drink the day before. An email was sent to parents the day before the recall day to remind them to log on the next day to complete Intake24. Parents also received an email on each recall day to prompt them to complete. Intake24 uses a well-established multiple-pass recall method whereby the user records all food and drinks consumed in the previous 24 h [22]. Portion sizes were estimated using a database of over 2400 photographs of more than 100 foods. The Intake24 database converts foods and drink reported to average daily intake of nutrients (e.g. sugars) through integrated food composition tables. The dietary outcomes included amount of sugars as well as the contribution of sugars to energy (kJ) as the latter accounts for increase in amount of food intake with age over the year of study. The dietary variables therefore included: total sugars (g/day); NME Sugars (g/day) (as NMES is a proxy for Free Sugars) assessed using the NDNS method [23]; the percentage contribution of total sugars and of Free Sugars to

total energy intake; the percentage contribution of main sources of sugars to total sugars intake; the change in intake of total energy and of total fat intake were also calculated.

Reported energy intake values were validated using parent-reported child body weight to determine basal metabolic rate [24] which was compared with reported energy intake to derive a Physical Activity Level (PAL). The Torun cut off values for PAL were used to identify any underreporting [25].

Statistical analysis

Mean intakes of energy (kJ), total sugars (g and % energy), Free Sugars (g and % energy) and fat (g and % energy) at each of the follow up time points were compared with baseline. Mixed effects linear regression models were used to assess changes in intakes over time, with a random effect at the participant level to account for repeated measurement on the same individual. To consider individual variation in changes in intakes over time, a random intercept with random slope model was used. Models were subsequently adjusted for gender and socioeconomic group. All individuals were included in the regression model as missing data can be handled within this framework using maximum likelihood estimation on available data at each time point. All analyses were conducted using Stata 15 (StataCorp, College Station, Texas, USA).

Qualitative interviews and analysis

One-to-one semi-structured qualitative interviews were conducted by telephone with a purposive sample of parents directly following the launch of the campaign. Parents who had indicated at recruitment that they were willing to take part in a telephone interview and who had completed dietary recalls for their child were contacted by email from the research team inviting them to participate in an interview. Sampling took into consideration child age, head of household occupation and geographical location.

Interviews explored a number of topics including parents': 1) understandings of the messages of the Change4Life campaign; 2) understandings of sugars and its impacts on health; and 3) accounts of the individual, family and social barriers experienced with respect to reducing their child's sugars intake.

Each interview was digitally recorded, transcribed verbatim and thematically coded and analysed using NVivo qualitative data analysis Software, version 11 (QSR International Pty Ltd.).

Results

In total, 837 participants were invited to take part in the first three time points. For the long-term follow-up, the 539 participants who completed two baseline dietary recalls, were invited to take part. The completion rates and sample demographics for each time point of the study are shown in Table [1](#).

Table 1 Completion rates and sample characteristics of those included in the analysis at each time point

A small number of invalid recalls were eliminated from the final dataset at each time point. Reasons included, the inclusion of alcohol (possibility that the parent completed the recall for themselves instead of their child), or a recall time of less than 2 min (suggesting the recall had not been completed accordingly).

Dietary outcomes

The average daily intakes of energy, sugars and fat at baseline, peak-campaign, immediately post-campaign, 10-months post campaign and 12-months post campaign are presented in Table [2](#).

Table 2 Mean (SD) and median (IQR) sugars and nutrient intakes

The PAL ratios averaged 1.35 (± 0.41) and 1.50 (± 0.44) for 5 year old and 1.27 (± 0.36) and 1.40 (± 0.47) for 6–11 year old boys and girls respectively. There was a statistically significant decrease in the percentage energy from total sugars across all time points compared with baseline, ranging from 2.5% at 10-months post campaign ($p < 0.001$), to 1.4% at 12-months post campaign ($p < 0.001$, Table [3](#)). A significant decrease in the amount (grams per day) of total sugars consumed was seen at peak campaign (by 6.2 g/day, $p < 0.001$), immediately post campaign (by 5.5 g/day, $p = 0.002$), and 10-months post

campaign (3.5 g/day, $p = 0.03$). Percentage energy from Free Sugars (NMES) significantly decreased across all time points with the exception of 12-months post campaign. The percentage energy from fat increased significantly across all time points, with the largest increase at 12-months post-campaign (2.4%, $p < 0.001$). Energy intakes significantly increased across all the post-campaign time points. Adjustment for gender and socioeconomic group (ABC1 and C2DE) did not attenuate the change in intakes across any time point.

Table 3 Post campaign changes in sugars and nutrient intakes

Sources of sugars

The percent contributions of the main dietary sources of sugars to total sugars intake are shown in Table 4. Data are presented for baseline, peak-campaign and 12-months post campaign (as indicators of short term and long term effect). Interquartile ranges indicate wide variation in the contribution of food groups to total sugars intake. There was a trend towards a small decrease in the contribution of fresh fruit to total sugars over the 12-month period and an increased contribution of soft drinks was observed. The contribution of other sources remained similar across the three time points.

Table 4 Percentage contribution (median (IQR)) of food groups to total sugars intake

Findings from qualitative interviews

The demographics of the sub-sample of participants who took part in the telephone interviews are shown in Table 5.

Table 5 Sample characteristics of those completing telephone interviews ($n = 20$)

The qualitative findings are summarised in Table 6. There was evidence of awareness raising of sugars consumption among parents and children, however, this was accompanied by an increased confusion over 'good' and 'bad' sugars. Parents described a number of behavioural changes following the campaign, including swapping 'unhealthy' foods for healthier versions or for a different product, and reducing portion sizes. Parents highlighted several barriers which prevent dietary change. These included time constraints due to busy lifestyles, leniency with regard to permitting sugary treats, and peer pressure from other parents who allow their children to consume sugary foods and drinks. Parents also described the easy availability of sweet treats and snacks not only in supermarkets but also in schools in the form of puddings.

Table 6 Qualitative findings and analysis

Discussion

To the authors knowledge this is the first study to measure the impact of a health marketing campaign

aimed at reducing sugars consumption on the detailed dietary behaviour of a national sample of children. The final sample was balanced for gender split, however, despite weighting the sampling procedure, the final sample included a relatively higher proportion of families from the ABC1 group. The study has shown that the health marketing campaign was successful in reducing the mean intake of total sugars by approximately 2% of total energy intake in a group of children whose families had shown an interest in previous Change4Life campaigns, however reductions were not sustained at the 12-month follow up. The qualitative findings indicate that parents want to reduce their child's sugars intake but societal barriers and confusion over types of sugars hamper efforts to change. The unintentional increase in the mean amount and percentage of energy derived from dietary fat of between 1 and 2.4%, may have resulted from an increase in consumption of milk or of higher fat savoury snacks as replacements for sugars-containing items. This finding highlights the importance of giving any nutrient specific advice in the wider context of a healthy diet; indeed the PHE's 2017 campaign focused on all elements of a healthier diet under the banner of Change4Life 'Be Food Smart' [26].

The reported data for intake of sugars and nutrients are comparable with the recently published UK data from the NDNS [12], which showed the average intake of Free Sugars was 54.5 g and 49.9 g for boys and girls aged 4–10 years respectively, contributing 13.6% (boys) and 13.4% (girls) to daily energy intake.

The data are similar to that for added sugars from other industrialised countries including Australia and the US: data from the 2011–12 Australian Health Survey showed children aged 4–8 years obtained 11.9% of energy from added sugars (~ 50 g/ day) [27]. Data from the US NHANES for the 6–11 years age group showed added sugars (including honey and syrups) contributed 16.2% to energy intake [28].

The present study showed a wide range of values for the per capita median contribution of a food group, known to be high in sugars, to total sugars intake. This in part is explained by the wide age range of the study population, as the contribution of different foods to sugars intake will change with age. The sample size was, however, not large enough to allow meaningful sub-group analysis by age. The data show that soft drinks and fruit juice make relatively large contributions; a finding that concurs with data from the aforementioned surveys in the UK, Australia and the US [12, 27, 28]. What is distinct from the current data is that the median contributions from known sources of sugars did not account for total sugars intake. This suggests that children obtain a substantial proportion of sugars from less obvious sources i.e. foods not perceived by parents to be high in sugars. The qualitative data support this and indicate concern amongst parents about the amount of sugars in unsuspected items such as pasta sauces and some breakfast cereals.

The campaign made no notable impact on the contribution of dietary sources of sugars. Trends towards an increased contribution from soft drinks

due to a possible shift in the source of sugars from foods to drinks, a trend which warrants further investigation, and a slight reduction in that from fresh fruit are of concern and contrast to the campaign messages. However, the qualitative data indicated confusion over 'bad' and 'good' sugars, with reference being made to restricting fruit intake because of sugars content. Despite the Sugar Smart app including clear information with respect to which sugars to limit, this sound information competes with misleading misinformation from other sources such as the media and internet. The public need to be made aware of where to look for credible information on food and nutrition, including information on sugars.

The qualitative findings showed that the health marketing campaign raised awareness of sugars in foods and drinks in both parents and children and impacted on foods bought and consumed by families. Data showed that in general, parents supported the messages of the campaign and want to control their child's sugars intake, but face challenges in putting this into practice, including misleading marketing, less obvious sources of sugars and confusion for which types of sugars to reduce.

The study has several limitations. First, parents were selected from the PHE Change4Life database, therefore it could be argued that they were potentially more motivated to make changes to their children's diets. Measuring individual exposure to the campaign was not possible. Second, food and drink intake was assessed at weekends only. This was

because children were not of an age where they could reliably record their own food intake and parent records of child food intake had to be relied upon. Recording at a weekend, when giving treats may be more likely, may have in part obscured the impact of the campaign. Children under the age of 10–11 years are unlikely to be able to accurately recall their food and drink intakes and estimate portion sizes due to limited cognitive ability [29]. Although conducted in a younger age group, research by Wallace et al. (2018) found that parents of pre-school children were able to report the food and drinks their child consumed using an online 24-h recall tool similar to Intake24 with reasonable accuracy [30]. Thirdly, the PHE Change4Life campaign was scheduled to run immediately in the New Year, following the holiday period as this is a time when people may be more perceptive to making healthy lifestyle changes [31]. This meant that seasonal activities may have impacted upon baseline data and seasonal fluctuation in intake may have contributed to the changes observed at peak campaign. To explore this phenomenon and control for seasonal variation, long-term follow up included data collection exactly 12 months from baseline and data at 10 month post baseline (outside the Christmas season). Although our results suggest a decrease in sugars intake that was not sustained, there were differences between 10 and 12 months data. At 10 months post-campaign there was a statistically significant decrease in percentage energy from Free Sugars, but this was not sustained at the 12 month follow up. Therefore a seasonal influence on sugars

intake cannot be ruled out. Finally, the study relied on self-reported dietary data, the limitations of which, including recall bias, are discussed elsewhere [32].

Conclusions

The Sugar Smart health marketing campaign was successful in raising awareness of sugars intake among parents and children who had shown an interest in previous Change4Life campaigns. This study suggests the campaign had a positive impact in reducing sugars intake, however reductions in sugars were not sustained. The findings suggest improved consumer education on different types of sugars and improved food labelling are needed. The health marketing campaign was, however, only one of a broad range of measures being introduced collectively by PHE to reduce sugars intake.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Notes

1. 1.

The sugars naturally present in milk and dairy products, fresh and most types of processed fruit and vegetables and in cereal grains, nuts and seeds are excluded from the definition.

Abbreviations

NDNS:

National Diet and Nutrition Survey

NHANES:

National Health and Nutrition Examination
Survey

NMES:

non-milk extrinsic sugars

PHE:

Public Health England

SACN:

Scientific Advisory Committee on Nutrition

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Acknowledgements

We appreciate all the parents who took the time to take part in the study. We also thank Kantar Public UK for their assistance with recruitment.

Funding

This research was funded by Public Health England and Newcastle University. The former advised on the study design and commented on the findings.

Newcastle University played a role in the design of the study, the collection, analysis, and interpretation of data, and in writing the manuscript.

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Contributions

JB conducted quantitative data collection (Intake24), data cleaning, data analysis and preparation of the manuscript. GG conducted quantitative data collection and analysis (Intake24) and preparation of the manuscript. MKR conducted quantitative data collection, data cleaning and data analysis (Intake24). MF conducted qualitative data collection and analysis and preparation of the manuscript. KM was statistical advisor and conducted quantitative data analysis. RH advised on the qualitative aspects of the study. EF advised on the use of Intake24. CE advised on the qualitative aspects of the project. ADB advised on the study design and commented on the findings. OH advised on the study design and commented on the findings. PM was the Principal Investigator, designed the study and drafted the manuscript. The authors read and approved the final manuscript.

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Ethics declarations

Ethics approval and consent to participate

Ethical approval was obtained from Newcastle University Ethics Committee (application number 01030). Written consent was obtained from all participants before participation in the study. Eligible participants received an electronic participant information, consent (and child assent) documents

which parents/ guardians were asked to complete online.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Bradley, J., Gardner, G., Rowland, M.K. *et al.* Impact of a health marketing campaign on sugars intake by children aged 5–11 years and parental views on reducing children's consumption. *BMC Public Health* **20**, 331 (2020). <https://doi.org/10.1186/s12889-020-8422-5>

- Received 08 July 2019
- Accepted 27 February 2020
- Published 30 March 2020
- DOI <https://doi.org/10.1186/s12889-020-8422-5>

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Keywords

- Diet
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BMC Public Health

ISSN: 1471-2458

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