Annex 7 – Impact Assessment

Annex to Consultation on Television Advertising of Food and Drink to Children

Annex to Consultation

Publication date: 17 November 2006

Contents

IA Section 1

Introduction

1.1 This annex when read in conjunction with the rest of this consultation document and the Impact Assessment (IA) in the March consultation document and June update represents an IA, as defined by Section 7 of the Communications Act 2003 ("the Act"). IAs form part of best practice policy making and are commonly used by other regulators. This is reflected in Section 7 of the Act, which means that generally we have to carry out IAs where our proposals would be likely to have significant effect on businesses or the general public, or where there is a major change in Ofcom's activities. In accordance with Section 7 of the Act, in producing this IA, Ofcom has had regard to such general guidance as it considers appropriate, including related Cabinet Office guidance and our own IA guidelines[1].

1.2 Ofcom asked a number of questions relating to the impact assessment (IA) in the March and June documents. For the most part, respondents chose not to answer the specific questions, but made detailed submissions on particular aspects of the IA. There was no substantive criticism of the methodology or approach used in the modelling and most of the comments on the modelling related to the assumptions that were used. The more detailed responses on the IA came from broadcasters who were commenting either on specific aspects of the methodology, or particular policy options. However, many broadcaster submissions were confidential and therefore have not been published on our website. We have taken their responses into account as appropriate and report responses on a non-attributed basis within this IA. Responses from consumer and health groups tended to be limited to the general assertion that broadcasters had a greater ability to mitigate revenue losses than had been assumed in the March and June modelling. These assertions were in general not supported by further argument or evidence. This annex groups the responses by topic and explains how Ofcom has developed its analysis and taken on board the consultation responses.

1.3 This annex does not repeat the discussion of the TV advertising market or the explanation of the detailed methodology used to analyse the different policy measures, which was set out in the March consultation document and updated in June, except where this is necessary to illustrate the comment on the consultation point raised.

1.4 In this IA, the impact on Ofcom's stakeholders (broadcasters, advertisers, independent television producers, viewers and consumers) is analysed, where quantifiable, with respect to the costs imposed on them; where not quantifiable, through a discussion of the type of costs that might be imposed by various policy measures. Ofcom has no expertise in nutrition or health related issues, or in the analysis of the economic impact of policy measures relating to population health. Therefore, in assessing the likely benefits of the different options, Ofcom has relied on analysis undertaken by the FSA as the body with the relevant expertise to make this assessment together with the Department of Health (DH). The benefits assessment was included with the March document and has been commented on, analysed and responded to and the benefits amended as appropriate. The full analysis is attached at Annex A of this IA and summarised in Section 8.

[1] http://www.ofcom.org.uk/consult/condocs/ia_guidelines/condoc.pdf

1.5 However, while economic analysis, such as the analysis presented in this IA can provide a valuable tool for evaluating and selecting different options for regulation, other factors, such as public policy considerations, also need to be taken into account. Ofcom recognises that there are inherent difficulties in seeking to quantify the likely costs and benefits of the options proposed. Analysis of the estimated costs and benefits of broadcasting restrictions should therefore be seen in this wider context.

1.6 In discharging its functions, Ofcom's principal duty is to further the interests of citizens and consumers (section 3 (1)). Ofcom is also required to secure a number of other matters including maintaining a sufficient plurality of providers of different television services (section 3(2)(d)) and the availability throughout the UK of a wide range of television services (section 3(2)(e)).

1.7 In performing these duties, Ofcom is also required to have regard to:

- the principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed, and any other principles representing the best regulatory practice (section 3(3)); and, where relevant:
- the desirability of promoting and facilitating the development and use of effective forms of self-regulation (section 3(4)(c));
- the vulnerability of children (section 3(4)(h));
- the interests of different ethnic communities (section 3(4)(l); and
- the opinions of consumers in relevant markets and of members of the public generally (section 3(4)(k).

1.8 Ofcom also seeks to abide by a set of regulatory principles which it has developed in the light of its general duties and the principles of best practice in regulation. These are published on Ofcom's website[2], but those of particular relevance to this consultation are as follows:

- Ofcom will strive to ensure its interventions will be evidence-based, proportionate, consistent, accountable and transparent in both deliberation and outcome;
- Ofcom will always seek the least intrusive regulatory mechanisms to achieve its policy objectives;
- Ofcom will research markets constantly and will aim to remain at the forefront of technological understanding; and
- Ofcom will consult widely with all relevant stakeholders and assess the impact of regulatory action before imposing regulation upon a market.

1.9 In addition to this IA, a race impact assessment has been carried out and is included at Annex 8 of the statement and further consultation document.

1.10 This Impact Assessment is structured as follows:

[2] *Ofcom's regulatory principles* (http://www.ofcom.org.uk/about/sdrp/).

- Section 2 sets out the economic rationale for intervention;
- Section 3 sets out the responses to the IA on particular issues;
- Section 4 sets out the different policy options considered and analysed;
- Section 5 sets out the methodology for estimating the impact on broadcasters of the policy options;
- Section 6 sets out the analysis Ofcom has undertaken to confirm the robustness of the modelling results;
- Section 7 sets out the results of the analysis of the impact on broadcasters;
- Section 8 sets out the analysis of benefits; and
- Section 9 sets out a summary of the proposed policy packages.

1.11 There are three Annexes to the IA which set out the revised FSA benefits assessment; the FSA's rebuttal of the critique of its original benefits assessment as submitted by Food and Drink Federation (FDF) on behalf of the industry; and the FSA's response to comments on its benefits assessment submitted by an independent dietitian.

IA Section 2

Economic Rationale for Intervention

Background

2.1 Section 4 of the March IA discussed the economic rationale for regulatory intervention. It concluded that:

- Taking into account the particular vulnerability of children, there may be an economic rationale for regulatory intervention to change the balance of food promotion to children, especially for younger children. Such intervention would be aimed at addressing the market failure caused by the lack of, or asymmetry in, consumer information on what constitutes a healthy balanced diet;
- The discussion also suggests that there may be a rationale for intervention based on the presence of externalities in the consumption of HFSS foods;
- At the same time, the discussion suggests that intervention in the TV advertising market *on its own* is not likely to be the most appropriate, nor the most effective way to correct these market failures.

2.2 The March IA also discussed using the Precautionary Principle to justify regulatory action – the principle that action may be justified even if the probability of a risk occurring is small, because the outcome might otherwise be very adverse.

Consultation Responses: Appropriate Age Range

2.3 A number of (primarily health and consumer interest) consultees argued there was also a case for protecting older children in the 10 -15 age range since this group were also subject to persuasion from adverts and they often had their own pocket money which they could use to make their own consumption decisions. Many of these respondents also argued that they were particularly concerned about the growing trend in obesity in this age range which is also when long term eating and health patterns are often developed that once established are very difficult to change. A few respondents argued that protection should be extended up to the age of 18.

2.4 The arguments made are set out in greater detail in the summary of responses at Annex 5 of the statement and further consultation document.

Ofcom's response

2.5 In response to the issues raised in the consultation responses, Ofcom revisited the research delivered by Professor Livingstone in 2004 which made the point that the ability to distinguish between advertising and programming and to understand its commercial intent did not equate to immunity from the persuasive effect of advertising. Two of the conclusions from the 2004 research were that:

> Children are affected by advertising at all ages. Surprisingly little is known of how media affect children differently at different ages, though it is commonly assumed that younger children are more influenced. Empirical studies of the effects of television advertising on children's food choice were re-examined according to the age of the sample. Contrary to widespread belief, this did not show that

> young children, being more vulnerable, are more readily affected than more media-literate teenagers. Instead, findings of effects are rather mixed for younger children and more clear-cut for older children and teenagers. It is argued that all age groups are affected by advertising, both because different persuasion processes operate at different ages and because, presumably as a consequence, each age group is targeted by age-specific forms of advertising[3].
>
> Literacy mediates the effects of advertising in two ways. Since it is argued both that advertising affects children across the whole age range and that advertising literacy varies significantly by age, it is concluded that no single process of persuasion can account for these findings. Consequently, we must rethink the assumption that, since children gain in advertising literacy as they become developmentally more sophisticated, this results in a greater ability to resist or defend against the messages of advertising. It is suggested that less literate viewers (generally younger children) are more influenced by superficial or peripheral features of advertising (e.g. celebrity sources, colourful and entertaining images), provided these are sufficiently attractive. On the other hand, more literate viewers (generally older children and adults) are more influenced by the quality of the arguments and claims of advertising, provided these are sufficiently strong, and provided the audience is motivated to engage with the message. Research suggests that this latter form of persuasion lasts longer.

2.6 Ofcom also noted that the literature review conducted by Professor Livingstone reported that the review by the USA's Institute of Medicine in 2005 found that adult healthy eating patterns are established in childhood but the diet of children and young people departed "substantially" from that recommended.

2.7 It does therefore seem realistic to assume that even if children between10-15 years old are able to discern the commercial intent of advertising, it still has the capacity to influence their consumption decisions and that these eating pattern once developed have long lasting effects. In addition, estimates[4] suggest that 25% of 11-15 year olds are classified as obese and that obesity rates in this age group are rising more quickly than in the 2-10 age range.

2.8 Ofcom has also considered other areas where a case has been made for restricting the advertising of items that are seen as having potentially adverse consequences.

2.9 Ofcom notes that tobacco products are not allowed to be advertised on TV, alcohol is not allowed to be advertised on TV to under 18s and that while to date gambling has not generally been allowed to be advertised on TV, there are exceptional categories which may be advertised, though not to under 18s[5] or under 16s[6]. This suggests that in other areas where there are concerns about the long-term impact of particular consumption decisions, there is a general acceptance that children up to 16 or 18 should be protected from the advertising of those products.

[3] http://www.ofcom.org.uk/research/tv/reports/food_ads/appendix2.pdf
[4] Health Survey for England (2004).
[5] Bingo
[6] Lotteries and Pools

2.10 Taking into account, the ability of advertising to influence consumption decisions, the composition of children's advertising, the significant and growing problem of teenage obesity and the recognition in other spheres that protection is afforded to children up to the age of 16 or 18, Ofcom has considered extending the restrictions on advertising to include older children up to the age of 16.

2.11 It is also the case that the benefits assessment provided by the FSA is largely based on the benefits to 11-15 year olds. Extending the protections to older children has the advantage of ensuring that the estimated benefits of the different options relate more closely to the group targeted by the measures.

IA Section 3

Responses to the IA on particular issues

Introduction

3.1 This section covers the responses to the IA and Ofcom's views on the following issues: product differentiation; brand versus product advertising restrictions; contract rights renewal (CRR); classification of children's channels; treatment of channels licensed in the UK and broadcasting to overseas markets from the UK; the risk of UK channels moving overseas; modelling of the impact of the content rules; the choice of base year; the impact on food manufacturers and advertisers; the impact on original children's programming; implementation issues; and the impact of digital switchover (DSO).

Product differentiation

3.2 As discussed in the statement and further consultation document above, Ofcom received a number of comments on product differentiation (between HFSS and non-HFSS food and drink) and the use of nutrient profiling (which is necessary to achieve this). These are set out in more detail in the summary of responses at Annex 5 to the statement and further consultation document.

3.3 A number of organisations supported differentiation including the great majority of consumer and health related organisations, some broadcasters and some food manufacturers. Differentiation was also strongly supported by consumers within the deliberative research, and by consumers who submitted individual responses to Ofcom. However, all the advertising organisations and the majority of food manufacturers opposed differentiation.

3.4 The key arguments in favour of differentiation were that:

- it would be illogical and counter-productive to public policy objectives to prohibit the advertising of healthy foodstuffs;
- it would provide an incentive for reformulation and innovation; and
- it would provide the broadcasters with a greater opportunity to mitigate the loss of revenue that the restrictions would otherwise impose.

3.5 Those opposed to such a scheme argued that:

- few, if any food or drinks are harmful in moderation;
- differentiation would demonise certain foods or drinks; and
- they had concerns about the use of the FSA model which was the only practical tool available to differentiate:
    - it gave some perverse outcomes;
    - it was based on weight rather than portion size;
    - it does not consider vitamin or mineral content; and

- it penalises nutrient dense foods such as cheese and cereals.

Ofcom's response

3.6 Ofcom believes that there are a number of arguments that support differentiating between HFSS and non-HFSS foods in the policy restrictions:

- Allowing advertising of non-HFSS foods would allow the opportunity for positive messaging e.g. recommending eating five portions of fruit and vegetables every day.

- Restricting the advertising of healthier foods would be counter to the general public policy objective of improving children's diets in order to reduce obesity.

- Restricting only HFSS adverts may encourage food manufacturers to develop healthier versions of products which are not HFSS according to the FSA model, so they would be able to advertise the product – resulting in a reduction in the amount of fat, salt or sugar (or an increase in fruit or fibre) in children's diets. If all food and drink adverts were banned then food manufacturers would have no such incentive to do so.

- Restricting all food and drink adverts may also reduce manufacturers' incentives to create new healthy food or drink products as they could not be advertised on television.

- Restricting all food and drink adverts results in higher costs of the policy measures (because broadcasters have a greater range of products that they are unable to advertise – see paragraph 5.18 below) and lower benefits (because the potential advantages of promoting healthier foods are restricted) than under an HFSS ban.

- Restricting the advertising of healthier foods – which do not contribute to the problem of child obesity - would be counter to Ofcom's regulatory principle of seeking the least intrusive regulatory mechanism to achieve our policy objectives.

3.7 However, Ofcom recognises that there are also arguments against product differentiation:

- It would be much easier to identify and therefore introduce restrictions on brand advertising and sponsorship, (in order to remove the risk of food manufacturers substituting brand adverts for products adverts) under a restriction on all food and drink adverts and sponsorship than under one restricting HFSS adverts and sponsorship which would require differentiation between HFSS and non-HFSS brands (see paragraphs 3.10 – 3.19 below).

- In using the FSA's nutrient profiling model there is a risk (given the difficulties in accurately defining healthier and less healthy foods) of restricting adverts for foods the consumption of which may be beneficial[7,8]. However if all food and drink adverts were restricted then instead of possibly restricting adverts for foods that we might want to allow to be promoted, the policy would certainly restrict advertising of foods that are definitely beneficial.

[7] Known as a 'Type 1' error.
[8] For example the model in its current form would restrict the advertising of some foods which contain vitamins and antioxidants that may have beneficial properties.

- In using the FSA's nutrient profiling model there is also a risk (given the difficulties in accurately defining healthier and less healthy foods) of allowing adverts for foods whose consumption we would want to restrict [9]. In this area, Ofcom relies on the FSA's scientific expertise to ensure that if there is this risk, it is relatively small and infrequent and that any such anomalies would be taken account of in future versions of the model.

- For companies such as restaurants and supermarkets which often use a mixture of products in adverts (or where products e.g. meals consist of a number of individual elements), there is a possibility that differentiation will create a large administrative burden in terms of whether such adverts may be shown in restricted times. In practical terms, there are some operational questions about the use of the any differentiation model in such circumstances that will need to be resolved.

- There is a risk that some consumers may not understand the implication of a food being designated as non-HFSS and assume that it can be consumed in large quantities without any adverse effects, and/or fail to understand the importance of eating a balanced diet.

3.8 Taking all of these factors into account, Ofcom considers that on balance it would be appropriate to limit the advertising restrictions by the adoption of nutrient profiling in the volume, scheduling and appropriate content restrictions.

3.9 Ofcom understands that the FSA is planning to review the operation of their model after it has been in place for around a year. If the FSA does decide to make changes to its model following such a review, Ofcom will have the opportunity to consider whether to adopt the amended model in the advertising and sponsorship restrictions.

Brand versus Product Advertising Restrictions

3.10 The March IA discussed the role of TV advertising in terms of creating brand awareness / strengthening brand loyalty as well as directly promoting particular products. Recognising that the treatment of brand advertising was a complex area, the March consultation document asked for views on whether the packages should include restrictions on brand advertising and sponsorship and if so, what criteria might be used to define a relevant brand. It also asked about the possibility of food manufacturers substituting brand advertising and sponsorship for product promotion.

3.11 The consultation responses were roughly equally split between those who supported restrictions on brand promotion and those who did not. Broadly, broadcaster, advertiser and food industry interests rejected the idea of restrictions on brand advertising, whereas consumer and health respondents were keen to see the advertising of brands restricted as well.

3.12 Arguments put forward against the restriction of brand advertising included:

- The purpose of brand advertising was not to drive sales or promote a product;

- Responsible manufacturers needed to be allowed to educate consumers;

- It would be impractical and discriminatory to penalise brands for only part of their portfolio;

[9] Known as a 'Type 2' error.

- Brand advertising provided an additional sources of revenue for broadcasters;
- It would be difficult/impossible to define criteria on which to restrict brands;
- It would be rare for advertisers to substitute brand advertising for product advertising; and
- Restrictions would illegitimately restrict business from advertising their multiple products and might lead to claims about anti-competitive restrictions.

3.13 Those who supported the inclusion of brands in the restrictions suggested that:

- It was important to adopt a holistic approach to the policy;
- It was "nebulous" to differentiate between brand and product advertising;
- To continue to permit brands associated with HFSS foods would create a loophole in the restrictions potentially leading to substitution of brand advertising for product advertising.

Ofcom's response

3.14 In a very general sense, the primary intention of brand advertising tends to be aimed at enforcing brand attributes to create and maintain customer loyalty, while product advertising tends to be aimed at influencing short-term consumption decisions. However there is clearly a wide variation in both intent and effect between the very large range of examples of both types of advertising.

3.15 Given that some brands are very closely associated with a range of HFSS products (e.g. confectionery manufacturers and fast food outlets), Ofcom recognises the risk that through substitution of brand advertising and sponsorship for product advertising and sponsorship, manufacturers of HFSS foods may attempt to (or indeed succeed in) circumventing the intention of the restrictions.

3.16 However, imposing restrictions on brand advertising would constrain companies from repositioning their product range over time and could also prevent or make it more difficult for companies to enter new product markets. Ofcom believes that it is important to maintain incentives on food manufacturers to reformulate their existing product ranges and to innovate in terms of developing new products (see discussion of product differentiation at paragraphs 3.2 – 3.9 above) - a complete ban on both product and brand advertising could reduce this incentive.

3.17 It is possible that restricting advertising of HFSS brands might lead to less differentiated product groups and therefore increase the focus on price competition in the market (through reducing the influence of brands). Such an increase in competition might lead to increased consumption of HFSS food and drink.

3.18 In order for Ofcom to make a distinction between HFSS brands and non-HFSS brands, there would need to be some sort of analytical tool to differentiate between the two (although as discussed in paragraph 3.7 above, if the policy restriction was not differentiated and covered all food and drink adverts, it would not be necessary to differentiate between different types of brands and a restriction on brand advertising would be much easier to introduce). While some respondents suggested possible criteria for assessing brands such as some sort of weighting mechanism e.g. weighting products by their share of a company's total turnover, in practice

developing such a tool is likely to be highly contentious, difficult and costly to operate and enforce for both advertiser and regulator and take a considerable amount of time to develop and test.

3.19 Taking these factors into account, Ofcom considers that it would be appropriate to exclude generic, non-product-specific, brand advertising and sponsorship from the volume and scheduling restrictions and the content rules. Although Ofcom considers that such brand advertising should be allowed, it would recommend that the situation is monitored to ensure that manufacturers are not abusing the spirit of the restrictions on product advertising.

Contract Rights Renewal (CRR)

3.20 In the discussion of the impact on broadcasters in the March IA, Ofcom referred to the Contract Rights Renewal (CRR) remedy which applied to ITV1. Ofcom commented that although the policy options which were being considered would have an impact on the current contracts that had been negotiated between ITV and advertisers, the restrictions should not have an adverse effect on agencies' ability to roll over their existing contracts.

3.21 ITV commented on the issue of CRR in its confidential response. No advertisers commented on the impact of CRR.

3.22 Ofcom's standards objectives give it the power to impose restrictions on the volume and scheduling of advertising in pursuance of its standards objectives, in spite of a possible impact on the operation of the CRR remedy. Ofcom has considered this issue and considers that it is not necessary to make any specific adjustment to its regulatory proposals to take account of ITV's particular circumstances.

Classification of children's channels

3.23 The consultation response from Trouble argued that they should not be included within the dedicated children's channel category due to the change in the market which Trouble was targeting. They argued that Trouble no longer appeared in the children's section of the Sky EPG and that it had shifted its focus away from 4-9 year olds.

3.24 GMTV's consultation response argued that GMTV at weekends should be classified as a children's channel and that GMTV2[10] which shows only children's programming should be considered as a children's channel throughout the week.

Ofcom's response

3.25 Trouble's profile has changed quite significantly over the last five years. It no longer appears in the children's section of the Sky EPG, the majority of its audience profile is made up of over 16s and the large majority of its children's genre programming has been replaced by more general (particularly entertainment) programmes. Therefore Ofcom agrees that Trouble should not be classified as a children's channel and has included it in the 'other cable and satellite' category.

3.26 GMTV2's broadcasts exclusively children's programming during weekday mornings and some children's programming at week-ends, therefore Ofcom agrees that

[10] GMTV2 broadcasts in the mornings between 06:00 and 09:25 on ITV2 in the same way as GMTV broadcasts in the mornings on ITV.

GMTV2 is a dedicated children's channel and it has been grouped within this category. However Ofcom has decided that GMTV should remain classified as a PSB. This is based primarily on the aim of identifying those channels for whom children's programming makes up all or the great majority of their output – this is not the case for GMTV which has children's programming and some current affairs at weekends, but shows more general programming during the week.

UK Licensed Channels Broadcasting Overseas from the UK

3.27 In their consultation responses, a number of children's channels expressed concern that the IA did not cover channels licenced in the UK and broadcasting overseas from the UK (which would be subject to UK regulation under the country-of-origin principle). One Dedicated Children's Channel (DCC) suggested that as a result the IA was "fundamentally flawed".

Ofcom's response

3.28 Ofcom recognises that the data sources used (BARB and Nielsen) are not 100% comprehensive in this respect: they do not cover services broadcasting to audiences outside the UK. Therefore this is not included directly in Ofcom's modelling of the impact on broadcasters.

3.29 In order to address this, Ofcom has sent out a number of data requests to try and gauge the financial impact of the restrictions on DCCs broadcasting overseas. The responses (which cannot be separated out by channel for confidentiality reasons) give some indication of the overall effect of the restrictions.

3.30 Based on these responses, the impact in terms of revenue at risk (NAR and sponsorship) in 2005 would be approximately £7-8m for Packages 1 or 2[11]. In addition the responses suggested that this figure has been increasing and may reasonably be expected to continue increasing.

3.31 Ofcom does not believe that it is appropriate to apply mitigation factors to the revenue at risk, because it is likely that advertisers in the countries in question would simply move to another channel that was not subject to the restrictions. Thus broadcasters are unlikely to be able to move this advertising to other parts of their schedules or raise prices to mitigate for revenue lost. In addition, the broadcasters stated that not all inventory on these channels was sold suggesting that they would have difficulty in attracting alternative advertisers.

3.32 Ofcom does not believe that there would be any significant benefit from such restrictions to overseas viewers of these channels due to the large number of other channels that would be likely to show HFSS adverts in these regions. Therefore inclusion of these restrictions would make no difference to the analysis of benefits.

Risk of UK Channels moving Overseas

3.33 As set out in the March IA, Ofcom accepts that ultimately some broadcasters which are currently licensed in the UK may choose to relocate to other territories in order to avoid needing to comply with these (or other UK) restrictions.

[11] While the data responses did not address the effects of other packages, we would expect them to be roughly proportionate to the relative revenue loss estimated for DCCs broadcasting to the UK.

3.34 Many of the multi-channel children's channels are multinational companies who are based in the UK and are licensed to offer services across a number of different European, Middle-East and African countries. Moving these services to another jurisdiction could be undertaken without any obvious changes to viewers in the UK. These broadcasters would need to weigh up the costs of relocation and the risk that the new jurisdiction might itself impose advertising restrictions in due course together with other factors, in the same way that the original decision to be based in the UK would have been based on a consideration of a range of factors. Ofcom assumes that a decision to transfer to another jurisdiction would take into account the UK regulatory regime as a whole (as well as the other benefits and costs of locating in the UK compared to other locations), rather than be driven by a change in one particular aspect of the UK's rules on advertising.

3.35 If broadcasters targeting the UK market were to relocate, they would still be able to broadcast their channels into the UK and viewers in the UK would still be exposed to HFSS advertising in and around children's programmes on these channels. This would tend to reduce the overall health benefits, but is an inevitable consequence of the country of origin principle stemming from the TWF[12] directive.

Modelling of the impact of the content rules

3.36 The March IA did not include a quantified assessment of the impact of the proposed new content rules for advertising food and drink. As was discussed (paragraphs 7.45-7.51) the nature of the proposals for content restrictions meant that it was very difficult to model their potential impact and as a result Ofcom did not propose to quantify the impact of these proposals. Instead Ofcom discussed their possible effect in qualitative terms. A key aspect of the proposals was that they would help to reinforce the effect of the quantitative restrictions on children's advertising. Ofcom commented that the proposals were not expected to impose significant financial costs on food manufacturers - Ofcom assumed that the fact that the proposals had been agreed by industry as members of BCAP, meant that manufacturers were aware of and committed to the proposals. In addition there would be a grace period for implementing new content rules which would allow manufacturers to make use of existing campaigns or campaigns that were in the process of being planned. It was also the case that the proposed content restrictions were common to the three packages that Ofcom was consulting on, so the impact in terms of costs and benefits would apply equally across all three packages.

3.37 In its consultation response, BCAP made the point that since Ofcom had not attempted to assess the beneficial impact of the content restrictions, there was a risk that the contribution to the benefits analysis of the content restrictions would go unnoticed. The response from the FAU argued that the impact of the proposed content restrictions has been under-appreciated and would have a significant impact in terms of changing the nature of food and drink advertising to children. However, neither BCAP nor the FAU put forward any proposals as to how these effects might be quantified.

3.38 The response from the IPA made a similar point in terms of the impact of the content restrictions being overlooked and went on to argue that the changes to the content rules would have a significant impact in the same way that code changes to the advertising of alcoholic drinks had had. However, it did not attempt to quantify the impact of the changes to the advertising of alcoholic drinks.

[12] The Television Without Frontiers directive, http://ec.europa.eu/comm/avpolicy/reg/tvwf/index_en.htm

3.39 The IPA also argued that the regulatory regime for food and drink advertising to children was already the most stringent in Europe. However, it did not provide any evidence to support this assertion.

3.40 Responses from consumer groups (e.g. Which, National Heart Forum) tended to be dismissive of the impact of the proposed content restrictions, particularly as they did not incorporate Nutrient Profiling.

Ofcom's View

3.41 Ofcom has looked again at the question of how the impact of the proposed content rules might be taken into account in the modelling of costs and benefits, but it remains inherently difficult to model their potential impact. If the restrictions are successful then - at a conceptual level - they should reduce the impact of the advertising of HFSS food to children and thus help to reinforce the positive health benefits of the measures. However, there does not appear to be any obvious way of moving from a qualitative description of the potential impact of the restrictions to actually quantifying what impact this might have in terms of either additional costs or additional benefits.

3.42 An important difference from the discussion in the March consultation document is that Ofcom is now considering what age range is appropriate for certain of the content restrictions. This may impose an additional constraint on the ability of food manufacturers to advertise HFSS products.

3.43 Ofcom considers that extending volume and scheduling restrictions on HFSS advertising to large sections of adult airtime is not consistent with its regulatory objectives: for instance, it has a disproportionate effect on broadcasters' revenues and is not particularly targeted (i.e. efficient) in terms of reducing children's impacts. Instead, Ofcom considers that the content restrictions have an important role to play in complementing the reduction of commercial impacts in and around programmes made for children that are brought about by the volume and scheduling restrictions and so prevent the purpose of the volume and scheduling restrictions from being subverted. The content restrictions will enable HFSS advertising to adults and mixed adult and child audiences to continue but will restrict it from being carried out in such a way as to directly appeal to children. For instance, tighter restrictions on the content of HFSS adverts across all times of the day will restrict the ability of manufacturers to design techniques to encourage poor nutritional habits.

3.44 On that basis Ofcom recognises that the changes to the content restrictions - if successful - should have an additional impact on broadcasters and manufacturers although the impact is extremely difficult to quantify. At the same time, the changes to the content restrictions - again, if successful - would lead to particular health benefits. It is difficult for Ofcom to assess the relative magnitude of the two effects although, as a matter of judgement, Ofcom does not consider that the negative impact of the content restrictions would outweigh the corresponding health benefits from the volume and scheduling restrictions

Choice of Base Year

3.45 The FAU in their response proposing a fourth option argued that the reduction in the amount of advertising should be set against a 2003 base year (rather than the 2005 base year used by Ofcom) on the grounds that that was the year in which the Secretary of State for Culture, Media and Sport formally announced the Government’s decision to review the advertising codes on food and drink advertising.

By taking 2005 as the base year, the industry argued that Ofcom had ignored the effect of the efforts advertisers have already made in changing their advertising in response to public and consumer concern.

Ofcom's response

3.46 Ofcom recognises that there has been a reduction in the amount of food and drink advertising that children see between 2003 and 2005. This reduction has resulted from a number of factors, including voluntary actions on the part of food advertisers and broadcasters, changes in children's viewing habits, as well as other market changes. Based on the FAU analysis[13], in 2005 children aged 4–9 saw 22% less food and drink advertising than they did in 2003, and children aged 4-15 saw 17% less food and drink advertising than they did in 2003. We recognise that the measurement of the degree of change since 2003 is a valuable indication of the degree of progress that has already been made, but any comparison of the effects of alternative policy packages must clearly be made against a consistent base year. Ofcom has used 2005 as the base year for all of its analysis, as the most recent year for which data is available and therefore the best data against which to estimate the effect of advertising restrictions that will not come into effect until 2007. However we have reduced the FSA's estimate of the benefits of removing HFSS advertising from TV by 18% to reflect our estimate[14] of the reduction in (4-15) HFSS impacts between 2003 and 2005 (see paragraph 8.33) to reflect the gains that have already been made in reducing HFSS impacts seen by children.

Impact on Food Manufacturers and Advertisers

3.47 In the original IA (at paragraphs 6.16-6.26) Ofcom suggested that, in the short to medium term, the impact upon HFSS manufacturers and advertisers was likely to be modest. This was a reflection of the research indications that advertising had only a modest direct impact upon consumption preferences and also the range of measures that manufacturers and advertisers could take to mitigate the effects of the restrictions on their revenues, including product reformulation in response to the use of Nutrient Profiling.

3.48 There was very little discussion of this point in the responses to the IA, even in responses from food manufacturers. Furthermore, none of the food manufacturers provided data to give an indication of how important TV advertising was to them or the impact that the proposed restrictions on food and drink advertising would have on them.

3.49 As set out in the original IA, Ofcom was aware that manufacturers were already incurring additional costs in terms of reformulating foods and making use of different avenues to promote HFSS products. From an economic point of view, Ofcom considers that it is important to provide the appropriate incentives to encourage manufacturers, where possible, to reformulate their products so as to change the balance of television advertising. Nutrient Profiling is one means of achieving this in that as well as providing a means of differentiating between existing HFSS and non-HFSS products, it also provides a transparent benchmark against which manufacturers can judge how to reformulate their products so as to be classed as non-HFSS.

[13] Note this analysis is based on weighted impacts – see footnote 37.
[14] Based on unweighted impacts – see footnote 37.

3.50 Ofcom understands that the cost of reformulation could be relatively modest. For instance, it has been reported[15] that Heinz has spent around £500k over the last two years in recipe development to cut the salt levels in its baked beans, pastas and children's food in addition to launching reduced sugar and salt version of baked beans. Other food manufacturers such as McDonalds, Birds Eye, Nestle and Krafts are also reported to have programmes to reduce the amount of fat, salt and sugar from their main brands: for instance, Birds Eye is reported[16] to have cut fat by 13% and salt by 19% over the last four years across its product range; and Nestle have reformulated or developed more than 700 of its products with lower fat, salt or sugar contents.

3.51 Taking these factors into account and given the lack of consultation responses to the contrary, Ofcom continues to believe that the incremental impact of the proposals to restrict the advertising of food and drink products on manufacturers is likely to be modest.

Impact on Original Children's Programming

3.52 In the original Impact Assessment, Ofcom recognised that restrictions on the volume and scheduling of food advertising could have an impact on the amount spent on original programming. This could affect the perceived quality of children's programming if broadcasters made more use of imported material and repeats and there could be a knock-on effect on production companies that make children's programming. However, Ofcom was not able to quantify the scale of such an impact.

3.53 Only a limited number of respondents to the consultation addressed this issue.

3.54 Pact (Producers Alliance for Cinema and Television) argued that Ofcom's proposals ran counter to its duties under the Communications Act which required that the public service remit for every Channel 3 service and for Channel 5 should include the "provision of a range of high quality and diverse programming". Pact also argued that the Act enshrined children's programming as a key public service genre and that in, determining the extent to which the purposes of public service programming were being fulfilled, Ofcom should ensure that such programming should:

> "[I]nclude what appears to Ofcom to be a suitable quality and range of high quality and original programmes for children and young people."

3.55 Pact argued that the proposed restriction on advertising would have a knock-on impact on programming budgets and would exacerbate the situation in which the number of hours of original children's programming by PSBs was falling. Pact cautioned that a reduction in the programming budgets of the commercial PSBs would have serious implications for the plurality of supply in public service children's programming and choice for viewers.

3.56 Pact also presented estimates of the effect the restrictions might have on independent producers of original children's programming: the modelling work focused on ITV and Five and did not include any commissioning that might be carried out by the dedicated children's channels. The results of Pact's modelling suggested that there could be a reduction in turnover amongst producers specialising in

[15] Sunday Times, 23rd July 2006. *"The recipe for healthy profits? Superbrands: Britain's strongest brands 2006 Sponsored supplement."*
[16] Op. Cit.

children's and animation of around 12% and 14% for Packages 1 and 2 respectively. The impact of Package 3 could be more significant in terms of leading to a 39% reduction in turnover. The impact of a pre-9pm ban would be a reduction in turnover of around 50%. Pact put forward a proposal for a Government-backed fund for children's programming as a way of addressing this concern.

3.57 A number of broadcasters also argued that a reduction in food and drink advertising would make children's programming less attractive and in particular would have an effect on budgets for original children's programming and new services.

3.58 A number of the responses from consumer and health groups recognised that the restrictions on advertising and sponsorship could have an impact on broadcasters' revenue and thus there could be a potential impact on children's television. However, a number of those respondents argued that broadcasters would be able to offset the loss of HFSS revenues from other sources e.g. replacing HFSS food products with non-HFSS products or other products, generating revenue from merchandising associated with spin-offs from children's programming, etc. Even in cases where respondents recognised that there would be a negative financial impact on broadcasters, they argued that it was not disproportionate for broadcasters to bear the cost of that impact given the wider health benefits from restricting advertising to children.

3.59 The estimates generated by Pact focus on the effect that a reduction in revenue would have on independent producers. Ofcom assumes that this is largely because ITV had already announced its intention to withdraw from the production of children's programming and to sell off its in-house production arm.

Ofcom's view

3.60 Ofcom notes that the methodology used by Pact makes a number of assumptions, in particular that producers would not be able themselves to identify new sources of funding given that Pact establish that much children's programming is already co-produced and relies heavily on sales from secondary sales and overseas exploitation. Also implicit in Pact's estimates is an assumption that there is a direct one for one relationship between the advertising generated by particular groups of programmes and the budgets for those programmes. In practice advertising revenues are not hypothecated in this way and scheduling decisions take into account a range of factors rather than simply the audience for particular programmes, not least of which are specific regulatory requirements and competition from other channels (e.g. the BBC's children's channels).

3.61 However, Ofcom does accept the argument that restrictions on food and drink advertising and sponsorship in and around children's programming could make the provision of children's programming in the UK commercially less attractive. In the case of ITV, Five and GMTV this could mean a reduction in the commissioning of original content and a greater use of repeats and acquired material. In the case of dedicated children's channels, it could mean plans to commission more original content could be postponed or abandoned. This would have a knock-on effect on independent producers and also on consumers in that audience research carried out by Ofcom indicates that viewers do value UK originated programming more highly than imported material and repeats.

3.62 Given the particular impact on dedicated children's channels, Ofcom is considering a phased implementation of any restrictions on food and drink advertising and sponsorship. A phased implementation would obviously provide those broadcasters

with a transition period in which to adapt to the restrictions and mitigate them where possible, and this would help to reduce the knock-on impact on original programming.

3.63 In the case of the PSB channels, Ofcom does accept that the net effect of the different packages being considered could have a knock-on effect on original children's programming, the scale of which is difficult to determine. However, much of the original production in the UK is already co-produced, so it is the case that independent producers have already shown themselves to be skilled at developing different sources of financing for their programmes. However the potential impact on original programming is a relevant consideration that Ofcom has taken into account when considering which of the various policy packages best meets Ofcom's various duties and responsibilities.

Implementation issues

3.64 A number of broadcasters raised issues about the implementation of Package 3. Although broadcasters argued that implementation of any restrictions by 1st January 2007 would be challenging, Packages 1 and 2 did at least make use of established regulatory concepts such as programmes made for children and indexing programmes of particular appeal to children. In contrast, Package 3 would require a longer lead-in time for implementation because broadcasters would need to develop specific trading policies and airtime management systems to cope with the clock hour restrictions of Package 3.

Ofcom's view

3.65 Ofcom recog*n*ises that Package 3 would be more complicated to implement then the other two policy proposals. It would also tend to be more difficult to monitor and there could be more issues of ensuring compliance than with the other proposals.

The Impact of Digital Switchover

3.66 As outlined in paragraph 5.3, Ofcom's analysis of the impact of the different policy options uses a static analysis of the market at a given point in time (2005). However with the move towards digital switchover (DSO) in 2012, it is likely that there will be a change in the balance of television viewing towards multi-channels and away from the terrestrial channels as households make the transition to digital viewing. Given that all the policy options considered (except the pre-9pm ban) restrict more HFSS impacts on multi-channels compared to PSBs (see Figure 7.1), the move to DSO is likely to increase the impacts restricted by the policies over time.

IA Section 4

Policy Options

4.1 The policy packages and options included in the March 28 consultation are summarised in Table 4.1 below.

Table 4.1: Summary of Packages/Options included in March consultation

<table>
<tr><th>Package 1</th><th>Package 2</th><th>Package 3</th><th>Pre 9pm</th></tr>
<tr><td colspan="4">BCAP content rules apply to all food & drink advertising and sponsorship</td></tr>
<tr><td>No HFSS advertising in programmes made for pre-school children</td><td colspan="2">No food or drink advertising in programmes made for pre-school children</td><td rowspan="4">No HFSS adverts or sponsorship before 9pm</td></tr>
<tr><td>No HFSS advertising in programmes made for children</td><td>No food or drink advertising in programmes made for children</td><td rowspan="3">The volume of food and drink advertising to be limited at times when children (4-9) are most likely to be watching</td></tr>
<tr><td>No HFSS advertising in programmes of particular appeal to children (4-9 yrs)</td><td>No food or drink advertising in programmes of particular appeal to children (4-9 yrs)</td></tr>
<tr><td>No HFSS sponsorship of programmes for children</td><td>No food or drink sponsorship of programmes for children</td></tr>
</table>

Note: Voluntary self-regulation was also considered as a policy option

Voluntary self-regulation

4.2 Ofcom has reconsidered the impact of voluntary self regulation in the light of consultation responses. As in the March consultation document, this has not been explicitly modelled, although Ofcom notes that there has been a reduction in the HFSS impacts delivered to children (4-15 years old) of 18% between 2003 and 2005 which must be ascribed at least in part to the impact of voluntary self regulation.

Option 4 Proposal

4.3 In the March Consultation and June Update, Ofcom invited stakeholders to propose a fourth package which achieved broad support and which stakeholders believed would meet Ofcom's regulatory objectives. A proposal for a fourth policy option was made by the Food Advertising Unit of the Advertising Association ("FAU"), on behalf of the food, soft drink and advertising industries, the Incorporated Society of British Advertisers ("ISBA"), the Institute of Practitioners in Advertising ("IPA") and the Food and Drink Federation ("FDF"). The consultation responses also indicate that this option is supported by a large majority of individual food and drink advertisers[17] and

[17] Supporters include: the BCCCA, CS, Kelloggs, MF, Nestle, CPUK, PepsiCo, SNCMA, UB, Vimto and Wrigleys.

has support from some of the broadcasters[18]. A copy of the FAU submission on the fourth policy option can be found among the consultation responses which have been published on Ofcom's website[19].

4.4 The elements of the fourth policy option as proposed by the FAU are:

- The package applies to all food and drink products, there is no use of a nutrient profiling scheme within this proposal;
- No food and drink advertising would be allowed within or around programmes made for pre-school children on any channel;
- The BCAP content rules would be applied to all food and drink advertising;
- No food and drink advertising would be allowed within or around programmes made specifically for children on ITV1, Channel 4 or Five and on all other channels of general interest (i.e. channels not specifically targeted at children);
- Food and drink advertising would be limited to a maximum of 30 seconds per hour on channels targeted specifically at children. This rule would also be applied to GMTV on weekend mornings when their schedule consists entirely of children's programmes;
- Food and drink advertising would not be excluded from programmes of particular appeal to children up to 9 years old (i.e. there is no exclusion of food and drink advertising from programmes which achieve a 4-9 year old child audience index of 120 or more[20]);
- The rules apply to food and drink advertising only, they are not applicable to sponsorship or to brand advertising;
- There are no restrictions on healthy eating and lifestyle campaigns.

4.5 The option is a hybrid of parts of Ofcom's Packages 2 and 3, and is intended by the FAU to deliver approximately the same effect as both, with less harmful effects to individual broadcasters. The detailed rationale for this option is set out in the FAU submission, in summary:

- The exclusion of nutrient profiling reflected the food industry's general opposition to the use of the FSA's nutrient profiling scheme;
- The FAU accepted the principle that no food and drink advertising should be scheduled around programmes made for pre-school children;
- The FAU also accepted the general principle of limiting the amount of food and drink advertising that children see, but aimed to achieve that in a way which

[18] The package generates support from some broadcasters, although this is generally qualified by a concern that the proposal does not incorporate some form of nutrient profiling scheme which would allow the broadcasters to mitigate some of the impact of the proposals on their businesses.
[19] http://www.ofcom.org.uk/consult/condocs/foodads/responses/eh/fau_opt4.pdf
[20] The viewing index reflects the proportion of 4-9 year olds in the programme audience compared to that in the total population. A programme of "particular interest" to 4–9 year olds is one where the proportion of 4-9 year olds in the audience is more than 20% higher than its proportion in the general population.

recognised the particular circumstances of channels which were targeted specifically at children and therefore had a particularly limited ability to mitigate the effects of a total ban on food and drink advertising to children. Food and drink advertising was therefore excluded completely from children's programmes on general interest channels, but volume restrictions were applied to children's channels;

- The proposal recognised the particular circumstances of GMTV, which in effect was treated as a general interest channel on weekdays but a children's channel at weekends. This was because of the particular constraints associated with its 3.5 hour per day licence which it was argued reduced the channel's ability to mitigate any revenue loss arising from a total ban on food and drink advertising to children;

- No restrictions were applied to programmes of particular appeal to children of 4 - 9 years old on the grounds that the audience targeted by such programmes was predominantly adult or family in composition and that the application of restrictions to such programmes would therefore be disproportionate. In addition the industry has reservations about the practicability and fairness of the use of 120 indexing as a means of identifying such programmes, in particular for the smaller audience channels where it was claimed that the small audience sizes for individual programmes often result in BARB figures for the demographic composition of the audience which were not statistically robust. There was a concern that in practice the 120 index would be applied more strictly to the larger audience PSB channels than to smaller audience channels. The industry also argued that the role of the 120 index is largely met by the BCAP content rules which constrained the triggers that might directly engage the interest of young children;

- Sponsorship was excluded on the grounds that it had not hitherto been part of the advertising regime and that Ofcom had specifically reserved the administration and regulation of sponsorship to itself;

- The FAU argued that the BCAP content proposals would have a significant effect in reducing the attractiveness of food and drink advertising to children, that Ofcom's impact analysis had not taken this into account, and that the volume and scheduling proposals should therefore be scaled back to take account of the effect of the content rules.

4.6 Ofcom has analysed the impact of this option using the same methodology developed for Packages 1, 2 and 3. The results of this analysis are set out in Section 7 below.

Pre-watershed 9pm ban

4.7 Ofcom has also reconsidered and reanalysed the impact of a pre-watershed ban on HFSS advertising in the light of the consultation responses received.

OLR Research

4.8 As part of the consultation process following the publication of the March consultation document, Ofcom commissioned deliberative research to be undertaken by Opinion Leader Research (OLR) on Regulating TV advertising of food and drink to children[21].

[21] http://www.ofcom.org.uk/research/tv/reports/regulating_tvadverts/

This report was designed to seek informed opinion from a random sample of consumers on the policy packages which had been consulted on by Ofcom, including on whether further or other measures would be preferable and to elicit views on key questions including voluntary self-regulation, the spectrum of policy options (from no action to a complete ban) and whether it is desirable to distinguish between HFSS and non-HFSS foods.

4.9 The OLR research was deliberative in nature and explored participants' reactions to different elements of Ofcom's original proposals rather than being focussed on developing a consumer based "Option 4". However a number of themes emerged from the research:

- Consumers supported incentives to promote "healthy" food;
- Consumers supported extending restrictions into the evening schedule, to include times when large numbers of children were likely to be watching;
- Consumers supported extending the protection to include older children (10-15 year olds); and
- Consumers supported strengthening the content rules, beyond those proposed by BCAP.

Additional Policy Options

4.10 Ofcom has taken the themes from the deliberative research and from the large number of consumer and health group responses which called for more extensive restrictions than those in the three original packages and has designed three new policy options (Modified Package 1 and Options 5 and 6). All of these options have the following elements:

- Use of a differentiation mechanism
- no HFSS adverts or sponsorship in programmes for pre-school children;
- no HFSS advertising or sponsorship in programmes made for children;
- no HFSS advertising or sponsorship in programmes of particular appeal to 4-15 year old children (i.e. extending the viewing index to cover older children); and
- strengthened BCAP content rules to apply to all food and drink advertising and sponsorship targeted at children under 16.

4.11 In addition Option 5 includes a total restriction of HFSS adverts and sponsorship between 4pm and 6pm, and Option 6 restricts HFSS adverts and sponsorship between 4pm and 8pm, on all channels. Ofcom has analysed[22] the impact of these options using the same methodology developed for Packages 1, 2 and 3. The results of this analysis are set out in Section 7 below.

Summary of Policy Options Considered

4.12 Table 4.2 below summarises the key elements of the options considered.

[22] Ofcom also undertook some preliminary analysis of a restriction between 6pm and 8pm, but considered that it would have a broadly similar impact to Option 6.

Table 4.2: Summary of policy options considered and modelled

<table>
<tr><th>Package 1</th><th>Package 2</th><th>Package 3</th><th>Pre-9pm</th><th colspan="2">Option 4
PSBs DCCs</th><th>Modified Package 1</th><th>Option 5</th><th>Option 6</th></tr>
<tr><td colspan="9">BCAP Content rules apply to all food and drink advertising and sponsorship</td></tr>
<tr><td>No HFSS adverts in progs for pre-school children</td><td colspan="2">No food and drink advertising in programmes for pre-school children</td><td rowspan="4">No HFSS adverts or sponsorship before 9pm</td><td colspan="2">No food and drink adverts in programmes for pre-school children</td><td colspan="3">No HFSS advertising in programmes for pre-school children</td></tr>
<tr><td>No HFSS adverts in programmes for children (4-9)</td><td>No food or drink adverts in programmes for children (4-9)</td><td rowspan="3">Volume of food and drink adverts and sponsorship limited at times when children (4-9) are most likely to be watching</td><td>No food and drink adverts in programmes for children (4-9)</td><td>Volume of food and drink adverts limited when children (4-9) are most likely to be watching</td><td colspan="3">No HFSS advertising or sponsorship in programmes for children (4-9)</td></tr>
<tr><td>No HFSS adverts or sponsorship in programmes of particular appeal to children (4-9)</td><td>No food and drink adverts or sponsorship in programmes of particular appeal to children (4-9)</td><td colspan="2">No restrictions</td><td colspan="3">No HFSS advertising in programmes of particular appeal to children (4-15)</td></tr>
<tr><td>No HFSS sponsorship of programmes for children (4-9)</td><td>No food and drink sponsorship of programmes for children (4-9)</td><td colspan="2">No restrictions</td><td colspan="3">No HFSS sponsorship in programmes of particular appeal to children (4-15)</td></tr>
<tr><td colspan="7"></td><td>No HFSS adverts 4-6pm</td><td>No HFSS adverts 4-8pm</td></tr>
</table>

Note: Voluntary self-regulation and an option similar to Option 6 with a restriction between 6-8pm were also considered but not fully modelled.

IA Section 5.

Methodology for estimating the Impact on Broadcasters of the Policy Options

Introduction

5.1 This section summarises the methodology that Ofcom has used to estimate the impact on broadcasters of the different policy options. It also sets out the consultation responses and Ofcom's views on the appropriate mitigation factors to use in the analysis.

5.2 It was mainly broadcasters who commented on the detail of the modelling of the cost of the different options. However, apart from comments about the principle underlying the approach (for example Sustain argued that: "children's health is of overwhelming importance compared to costs to industry"), there was no substantive criticism of the approach and methodology used in the analysis (as opposed to comments on the model inputs or modelling assumptions).

Original Methodology used in March IA

5.3 As detailed in the March consultation document, Ofcom developed a two step framework to assess the estimated loss of revenue to any broadcaster of the policy restrictions. The first step assessed the amount of each channel's current revenue that was directly at risk from the restrictions. The second step estimated the actual revenue loss by estimating broadcasters' ability to mitigate the effects of the restriction.[23] It should be noted that this analysis did not attempt to model future trends in the broadcasting market or how the market might develop, but was a static analysis of the market at a given point in time.

5.4 For each package, we compared the sum of HFSS or Core Category advertising revenues that would be lost to the channel's overall revenue[24] (from all sources including advertising, sponsorship and subscription).

5.5 In the absence of any specific breakdown of sponsorship revenue, Ofcom assumed that the percentage of the total that was HFSS or Core Category sponsorship was the same as the percentage of advertising that was HFSS or Core Category. To ensure consistency between data sources, the Nielsen advertising revenue was increased by the ratio of total advertising revenue plus total sponsorship income to total advertising revenue.

5.6 For Packages 1 and 2, the relevant HFSS or Core Category advertising income during programmes made for children was extracted directly from the Nielsen database. To assess the impact of the viewing index component of

[23] Further detail is available at http://www.ofcom.org.uk/consult/condocs/foodads/foodadsprint/annex6.pdf

[24] The data on the revenues generated by different categories of food advertising was from the Nielsen Media Research database June 2004 to May 2005. The data on the overall revenue for individual channels was from the 2004 annual returns to Ofcom which channels make as part of their licence obligations.

these packages Ofcom determined the percentage of total HFSS or Core Category impacts[25] that would be lost and applied this percentage to the relevant advertising revenue of each channel to give the revenue at risk. This revenue was added to the revenue at risk from a restriction during programmes made for children to arrive at the total revenue at risk for each channel.

5.7 For Package 3, Ofcom obtained the total volume of Core Category advertising per hour slot for each channel from June 2004 to May 2005 and then calculated the daily averages that this implied. The Package 3 restrictions were then applied to determine the proportion of Core Category advertising that would be lost per clock hour. This proportion of advertising lost per hour was used to determine the proportion of impacts lost per hour and thus the proportion of Core Category revenue of each channel to give revenue at risk[26]. The non-overlapping elements of this revenue at risk were added to the revenues which would be lost through a complete ban on advertising any relevant products during pre-school children's airtime to arrive at the total revenue at risk for each channel.

5.8 Ofcom then considered the opportunity for different types of channel to mitigate the revenue loss in order to estimate the actual revenue loss that might be faced by different channels. Ofcom used a range of mitigation factors to undertake sensitivity analysis of the results (see paragraphs 5.15 - 5.34).

Revisions for the June Update

5.9 For the June update, Ofcom updated the impacts, viewing and advertising spend data to calendar year 2005[27]. Ofcom also made some minor modelling changes including using adjusted Nielsen data on a half hourly basis for all the Packages. A detailed description of these changes can be found in the June update.[28]

Methodology used in this IA

5.10 The methodology underpinning the results presented in this IA is wholly consistent with that used in the June update with further updates to some parameters and inputs. The 2005 data on total revenue for broadcasters is now available and has been incorporated into the modelling – therefore the modelling estimates the revenue loss and proportionate revenue loss compared to broadcasters' 2005 revenues. The mitigation factors have also been updated (see paragraphs 5.15 – 5.34) in the light of responses to the consultation.

5.11 The main data sources used were:

- Nielsen Media Research:

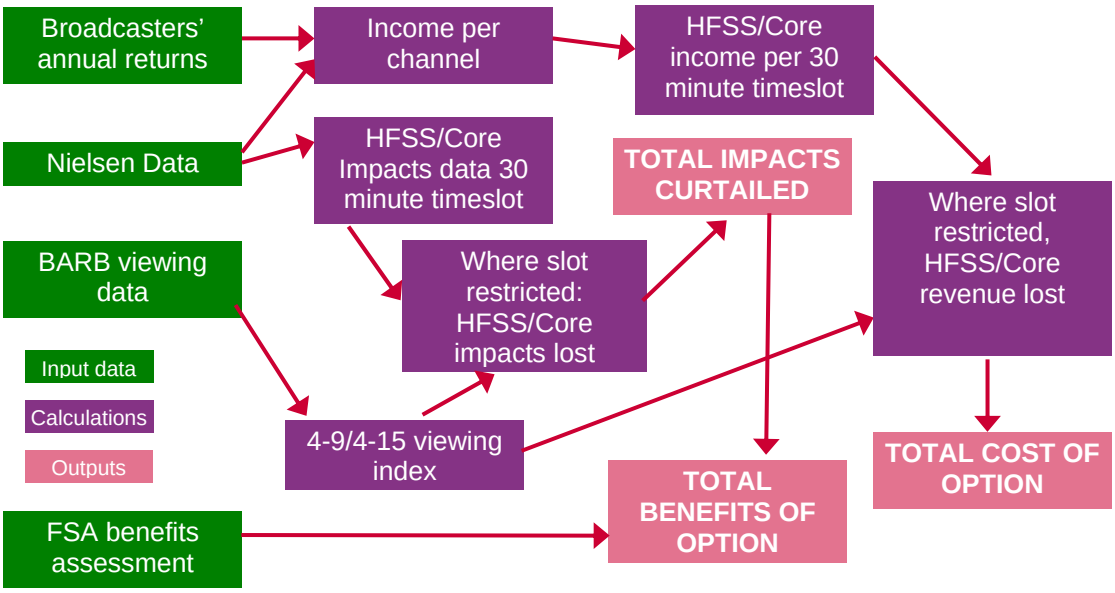
[25] An impact is one viewer watching one advert. Ofcom's analysis uses un-weighted impacts i.e. it does not take account of the duration of the advert.
[26] The assumption that the proportion of all HFSS or Core Category impacts curtailed indicated the proportion of HFSS or Core Category income at risk was relaxed when more detailed Nielsen data was used in the June update
[27] Data on total broadcaster revenue were still based on 2004 returns as the 2005 data were not available
[28] http://www.ofcom.org.uk/consult/condocs/foodads/update/update.pdf

- impact data by 30 minute time-slot for 2005 for HFSS and Core Categories for all broadcasters
- minutes of HFSS and Core Category advertising by 30 minute time-slot for 2005 for all broadcasters
- Nielsen estimated revenue derived from HFSS, Core Category and all advertising by 30 minute time-slot for 2005 for all broadcasters.

- Ofcom's annual license returns from the broadcasters.
- British Audience Research Bureau (BARB) data for the average viewing index of 4-9 and 4-15 age groups by 30 minute time-slot for 2005 for all broadcasters.
- Food Standards Agency (FSA) analysis of the benefits stemming from the removal of HFSS advertising.

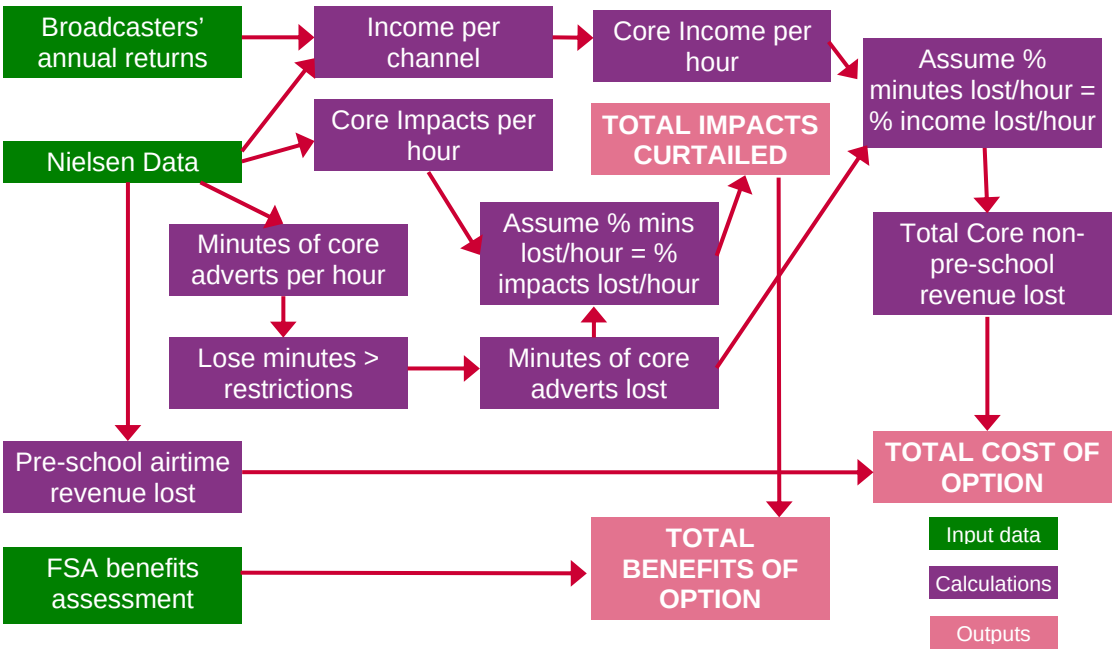
5.12 Figure 5.1 below shows the logic for all the packages using scheduling restrictions (all except Package 3 and the volume restriction part of Option 4).

Figure 5.1: Modelling of Scheduling Restrictions



5.13 For the packages which employ volume restrictions (Package 3 and the volume restriction part of Option 4), the logic in Figure 5.2 is used.

Figure 5.2: Modelling of Volume Restrictions



5.14 Options 5 and 6 were modelled in the same way as Modified Package 1 (i.e. using the 4-15 viewing index) with the extra inclusion of a block restriction between 4-6pm and 4-8pm respectively and the exclusion of double counting. In the light of the impact of these options on Music channels, this category has been separated out from the 'other cab-sat' category in the analysis of the results of the modelling.

Mitigation factors

5.15 In the March Consultation and June update documents, Ofcom discussed whether it was possible for broadcasters to mitigate some of the revenue lost through the restrictions proposed. Ofcom discussed five possibilities for mitigation: replacing HFSS advertising with reformulated foods; replacing HFSS advertising with other forms of non-HFSS (or non-food and drink) advertising, rearranging schedules and price effects associated with this; increasing the revenue from subscription; and reducing costs. Ofcom realised that the opportunity to use any or all of these approaches would vary between channels depending on the detailed circumstances relating to that channel, but suggested that there were sufficient similarities between channels within the same classification to support the use of common mitigation factors across classifications.

5.16 Table 5.1 sets out the mitigation factors that were consulted on.

Table 5.1: Mitigation factors in March Consultation

	Package 1		**Package 2**		**Package 3**		**Pre-9pm**	
	PSB/cabsat	DCC	PSB/cabsat	DCC	PSB/cabsat	DCC	PSB/cabsat	DCC
Low	35%	25%	35%	25%	45%	35%	35%	25%
Med	45%	35%	45%	35%	55%	45%	45%	35%
High	60%	50%	60%	50%	70%	60%	60%	50%

5.17 In response to the consultation Ofcom received a number of comments from the broadcasters. Many of these responses were confidential but we have summarised them below on a non-attributed basis.

Broadcaster responses

Reformulation

5.18 Many of the broadcasters stated that if there was to be any mitigation at all, this would come from being able to advertise healthier or re-formulated alternatives rather than from new advertisers or price rises. Thus they felt there was more scope to mitigate under Package 1 than under Packages 2 or 3.

New advertisers

5.19 All the broadcasters discussed the fact that there is currently inventory that is unsold and that the forecasts for TV advertising suggests that this is unlikely to change in the near future. As such they do not think that even if the price of airtime were to fall further that new advertisers would necessarily enter.

Scheduling movements and price effects

5.20 Ofcom in the March Consultation discussed the ability of broadcasters to move adverts around the restrictions and the price effects of doing this. A number of broadcasters commented specifically on this.

5.21 The broadcasters stated that although HFSS adverts could be moved to other times of the day, this was likely to result in advertisers paying more for the advert and that they would be likely to move to a different form of advertising as a result. One broadcaster argued that, if for example an advertiser currently spends 100% of their spend before 9pm in programmes made for children at a 40% discount on SAP, then to move to a post-9pm slot would result in them paying a SAP premium of 27.5%. In addition it may be the case that this airtime is less efficient at delivering the correct number of impacts of the target audience for them, increasing the cost per impact further.

5.22 Broadcasters further stated that non-HFSS advertisers, who advertise in these premium slots, may shift to other media as well because they also are unwilling to accept a price rise.

5.23 In addition to these particular price effects, two broadcasters discussed the potential loss that could occur from booking inefficiency. This looks at the way broadcasters place adverts according to target audience and number of individual viewers needed. For example if an advert had to be moved, it may be the case that instead of showing it just once it would need to be placed twice in order to get the required number of viewers, thus creating an inefficiency.

5.24 In placing adverts, broadcasters state that in a particular commercial break similar products and services are generally not advertised together. Although this exclusivity is not a “rule” it is a convention that advertisers require from broadcasters which restricts their ability to move adverts around the schedule.

5.25 Broadcasters also noted that the tougher the restrictions, the harder it is to replace adverts moved from one part of the schedule to another. For example many of the broadcasters commented that under a pre-9pm ban, it would be impossible to replace all of the HFSS adverts lost pre-9pm with post-9pm slots. One PSB broadcaster stated that a pre-9pm ban would remove 80% of inventory available to HFSS advertisers. This implies that the mitigation scenarios should be different between the options.

5.26 There were some broadcasters who discussed the fact that CPT/SAP was likely to fall. Although they suggested that this would not in general encourage new advertisers to entry, they did suggest that it may encourage low quality adverts for example from loan companies, but that these are not generally suitable to be shown to children and so are not a realistic substitute.

5.27 The DCCs highlighted in their responses the fact that the pool of advertisers willing to use children's channels is much smaller than for terrestrial channels and that they should therefore have different mitigation factors. In addition they stated that because their audience size is much less than the terrestrials, they are often unable to deliver the impacts needed for some campaigns. This restricts the number of advertisers that would choose to advertise with them and their ability to charge a premium in non-restricted airtime.

Subscription

5.28 All the broadcasters stated that increasing subscription revenue was not an option available to them. For example one broadcaster stated that it recently had to accept a rate reduction on its carriage arrangements with all UK platforms in order to secure longer-term carriage for its channels on the platform.

Reducing Costs

5.29 The broadcasters were concerned that any mitigation attained through reducing costs would impact on the quality of the programming (and not just children's programmes) and that this will impact on audience numbers, thus deterring advertisers from using a particular channel and sparking a downward spiral.

Additional comments

5.30 A number of broadcasters submitted to Ofcom their views on what the mitigation rates should be. These ranged for the PSBs between 0%-75% depending on the option (with the pre-9pm ban and Package 3 offering the least opportunity for mitigation) and for the DCCs between 0%-35%.

5.31 In addition Ofcom received a few responses regarding the mitigation factors from non-broadcasters. These comments varied between those who agreed with the broadcasters that the mitigation scenarios were too high, to those who suggested that broadcasters would be able to replace all revenue lost. However, in general these arguments were not supported by further evidence for the assertions and Ofcom has placed a lesser weight on them.

Ofcom's views

5.32 As summarised above, Ofcom has received a number of comments and additional information on the mitigation scenarios set out in the March document, and has considered these in assessing whether any changes to these factors are required (including the broadcasters' views on the actual amount that they might be able to mitigate the revenue loss by in practice). Ofcom accepts that opportunities for mitigation are likely to arise mostly from non-HFSS products (particularly for DCCs) and that the tighter restrictions will reduce the opportunity to mitigate the effects through rearranging schedules and may lead to booking inefficiency.

5.33 While there is inevitably some judgement required in determining the appropriate mitigation factors to use in the analysis, Ofcom has developed a set of principles to assist in making this determination:

- The more restrictive the policy option (as estimated by revenue at risk pre-mitigation) the lower the opportunity for mitigation;
- Mitigation should be higher for options that use NP than those that do not (other things being equal);
- DCCs generally have less opportunity to mitigate revenue loss than other channels;
- For policies that use a 4-15 viewing index restriction, Music channels are likely to have a similar opportunity to mitigate revenue loss as DCCs.
- New policy options should be derived by interpolation between mitigation factors for existing packages; and
- The difficulty broadcasters have in selling their existing inventory suggests that the opportunity to mitigate is lower than previously assumed.

5.34 Taking the consultation responses into account, the principles set out above and the need to ensure consistency between options, Table 6 sets out the mitigation factors that Ofcom has used in our current estimate of the revenue loss to broadcasters.

Table 5.2: New mitigation factors

	Package 1		**Package 2**		**Package 3**		**Pre-9pm (HFSS)**	
	PSB/ cabsat	DCC	PSB/ cabsat	DCC	PSB/ cabsat	DCC	PSB/ cabsat	DCC
Low	40%	10%	30%	5%	20%	15%	15%	10%
Med	50%	20%	40%	10%	25%	25%	20%	20%
High	65%	30%	50%	15%	40%	35%	30%	30%

	Option 4		**Modified Package 1**		**Option 5**		**Option 6**	
	PSB/ cabsat	DCC	PSB/ cabsat	DCC/ Music	PSB/ cabsat	DCC/ Music	PSB/ cabsat	DCC/ Music
Low	30%	15%	40%	10%	35%	10%	20%	10%
Med	40%	25%	50%	20%	45%	20%	25%	20%
High	50%	35%	65%	30%	60%	30%	30%	30%

IA Section 6

Analysis used to confirm the robustness of the modelling results

Introduction

6.1 There was no substantive criticism of the modelling approach used in the March IA. However, Ofcom has undertaken a number of pieces of analysis to confirm the robustness of the modelling assumptions and results and its consistency with alternative approaches. This work has included:

- comparison of the results based on averaged data from the model with a more detailed 5 week sample;
- comparison of Ofcom estimates of impacts reduced with estimates from the FAU;
- comparison of Ofcom estimates of revenue affected with broadcaster's own estimates of the impact on the their revenues; and
- analysis of the robustness of the viewing index threshold chosen.

Using a more detailed 5 week sample to confirm the modelling assumptions

6.2 The modelling described in Section 5 used total impacts and revenues across the year and yearly averages for viewing indices to construct the costs and benefits which would result from any particular package of restrictions. Although we believe this approach to be robust there are potentially some limitations in the modelling[29]:

- **Averaging over the week**: although the proposed restrictions are tailored for weekdays, Saturdays and Sunday, the modelling of programmes of particular appeal to children for Packages 1 and 2, Modified Package 1 and Options 5 and 6 averages across the entire week, so that the same restrictions (in terms of what constitutes programmes made for children and which time slots index at over 120) are applied on all days.
- **Averaging over the year**: since Ofcom's modelling of programmes of particular appeal to children looks at the whole of 2005, it averages over the entire year. Therefore, if a particular half-hourly slot were to average a child index of less than 120 across the year, it would not be modelled as restricted - even if it included some programmes that index above 120 (and vice versa).

6.3 To address these two potential limitations Ofcom decided to check the robustness of the estimates by modelling a smaller sample of data in detail,

[29] Note neither of these limitations would apply to the modelling of DCCs since the restrictions on them do not include use of the viewing index.

on a programme-by-programme basis (ie without averaging). Therefore, for five non-contiguous weeks spread throughout the year[30] BARB data was collected on the viewing figures and indices associated with all programmes broadcast on ITV, GMTV, Channel 4, Five and Sky One. These channels were chosen due to the large number of HFSS/Core impacts that they deliver (between them they account for approximately three-quarters of all child impacts not on DCCs in 2005).

6.4 The averaged restrictions were applied to the 5 week data set (to determine which half-hourly slots would be identified as programmes made for children or indexing over 120 under the averaged approach). Then, the programmes were examined on an individual basis, so that weekends were differentiated from weekdays (in terms of whether they were programmes made for children) and each programme's viewing index was considered on an individual basis. This precise approach eliminated the averaging used in Ofcom's main analysis. However, the 5 week dataset is a sample from a full year's dataset and therefore will be subject to sampling error.

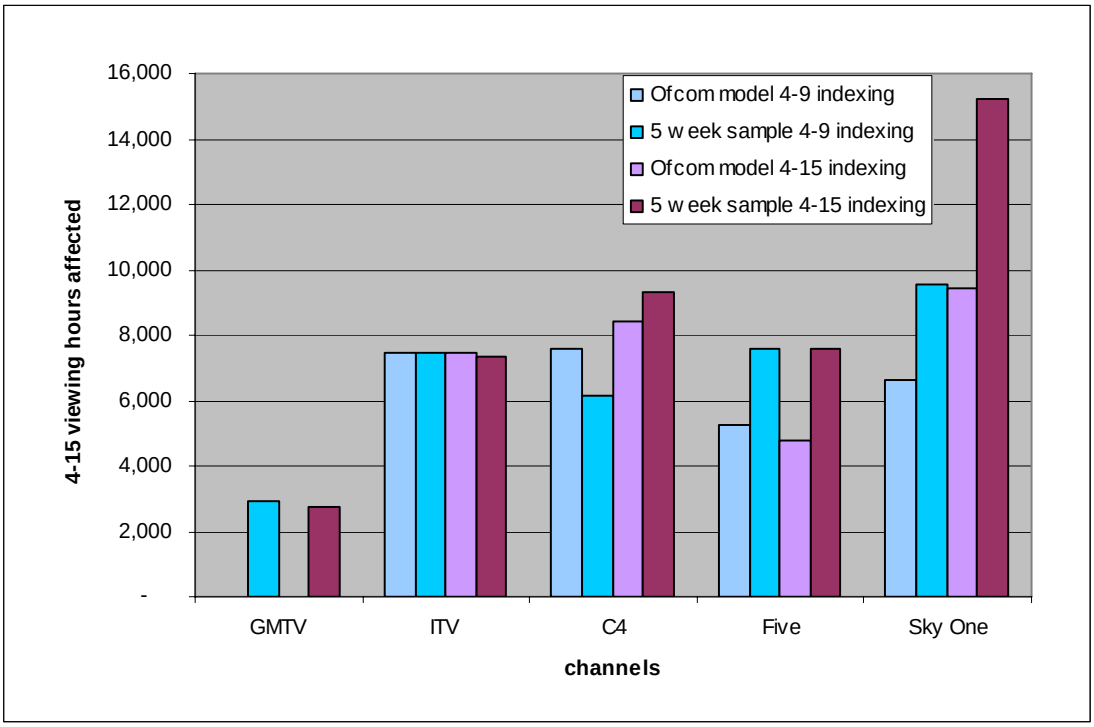
6.5 The results for these two approaches were then compared for each of the 5 channels in terms of the number of 4-15 viewing hours[31] and total viewing hours that were impacted by the restrictions. The number of 4-15 viewing hours restricted was used to indicate the number of 4-15 HFSS or Core Category impacts that would be reduced by the policy. The number of total viewing hours restricted was used to indicate the financial impact on broadcasters.

6.6 If the analysis of the 5 week sample showed that more 4-15 impacts or total viewing hours were restricted under Ofcom's averaged approach than under the precise approach, then this would indicate that Ofcom's model overestimates the reduction in impacts or the financial effects respectively of the restriction (and vice versa).

[30] These weeks were 8-14 August 2005, 21-27 November 2005, 23-29 January 2006, 18-24 April 2006 and 19-25 June 2006.

[31] One viewing hour is one member of the target audience (4-15 year old or all viewers) watching one hour of programming - it measures the effectiveness of the advertising restrictions.

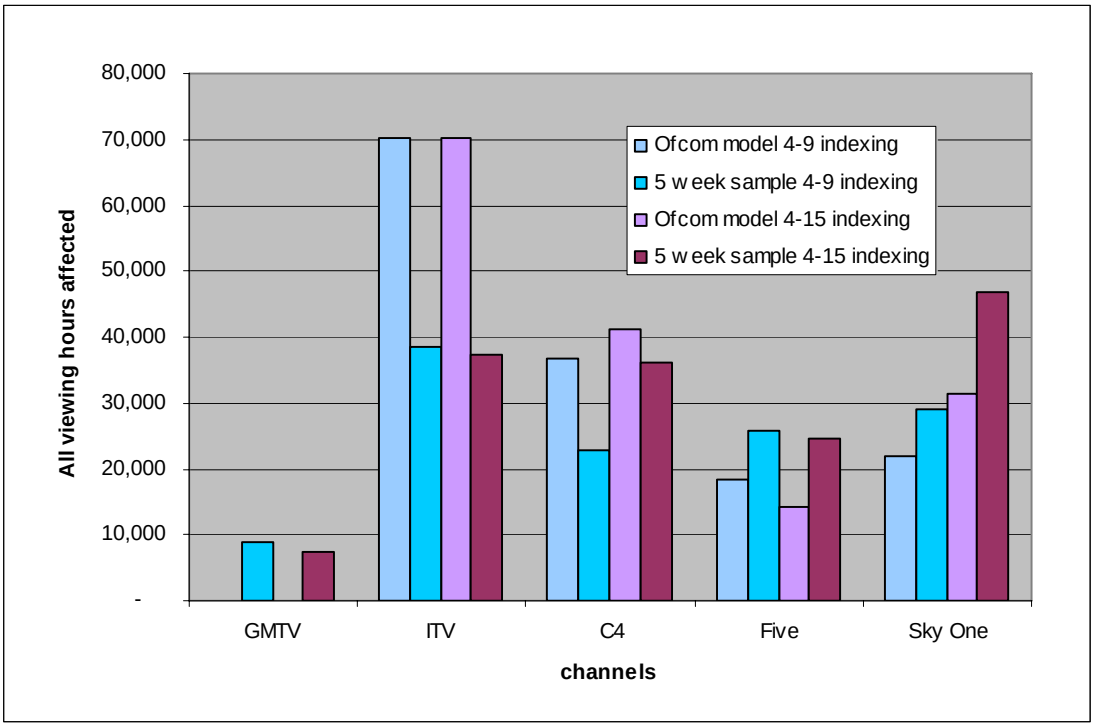
Figure 6.1: Comparison of Ofcom averaged estimates of reduction in impacts with a precise estimate of this reduction



6.7 Figure 6.1 above compares Ofcom's averaged estimates, with a precise application of Ofcom's restrictions. It compares the number of 4-15 viewing hours restricted under both methodologies as a result of a policy restriction on programmes made for children and a child viewing index based on either 4-9[32] or 4-15[33] year olds. This shows that for GMTV[34], Five and Sky One, the averaged approach underestimates the precise estimate of the reduction in both 4-9 and 4-15 impacts. For ITV the two approaches are very similar for both measures, while for Channel 4 the averaged approach is a slight overestimate for 4-9s and a slight underestimate for 4-15s.

[32] As used in Packages 1 and 2.
[33] As used in Modified Package 1 and Options 5 and 6.
[34] For GMTV the averaged approach does not pick up the children's programming at weekends since these are averaged out across the week to an index of below 120.

Figure 6.2: Comparison of Ofcom averaged estimates of reduction all viewers with precise analysis of this reduction



6.8 Using the estimate of the reduction in total viewing hours as an indication of the financial cost to broadcasters of the measures, Figure 6.2 above compares the financial cost to broadcasters under both methodologies. It shows that policy restrictions based on both 4-9 and 4-15 indexing indicates a greater cost to GMTV, Five and Sky One under the precise approach than under the averaged approach. However, for ITV and Channel 4 the costs under both types of restriction would be lower under the precise approach than under the averaged approach.

6.9 Across all 5 channels in the sample, the total reduction in impacts under the Ofcom approach is reasonably close to but lower than the precise approach; while the total estimated impact on broadcasters' costs is also close to but higher than the precise approach.

6.10 This analysis suggests that Ofcom's approach is a reasonable way to model the overall impact of the policy restrictions. While the modelled estimates of the effects on individual channels may be subject to some margin of error due to the effect of averaging, the estimates for categories of channels and the total for all channels are likely to be reasonably robust.

Industry Analysis of the Packages

6.11 In addition to the validation of the results of the analysis provided by the analysis set out above, the results also accord well with analysis undertaken by the industry to estimate the effect of different policy packages.

Analysis by the FAU

6.12 As part of its submission, the FAU calculated the effect of its policy proposal (Option 4) on the amount of advertising that children see and compared this

with their estimates of the effectiveness of Packages 2 and 3 in reducing child impacts. The FAU calculations[35] were made using the detailed data available to broadcasters and advertisers and use standard industry data sources. They were based on actual data for calendar years 2003 and 2005 on the amount of food and drink advertising shown on all channels and on BARB data on actual viewing levels.

6.13 The methodology used for the modelling exercise undertaken by the FAU was similar to that undertaken by Ofcom, however any modelling exercise of this nature inevitably requires an element of judgement in the use of a number of simplifying assumptions to handle the large amount of data being processed.

6.14 In terms of the differences between the Ofcom and FAU methodologies, the most significant are that the FAU has estimated viewing data for under 4 year olds using the 'Housewives with children 0-3' dataset from BARB. The FAU has also used weighted rather than un-weighted impacts[36] and has taken the impact data from BARB rather than Nielsen. However, as shown in Table 6.1, after correction for the difference in base year, the two methodologies appear to give reasonably consistent results.

Table 6.1: Comparison of Ofcom and Industry analysis for 2005[37]

	Reduction in Impacts – Ofcom		Reduction in Impacts - FAU	
	Children 4 - 9	**Children 4 – 15**	**Children 4 – 9**	**Children 4 – 15**
Package 2 (without 120 indexing)	44%	31%	45%	33%
Package 3	44%	36%	40%	30%
Option 4	30%	21%	34%	25%

Source: Ofcom and FAU analysis

Analysis in other broadcasters' consultation responses

6.15 In the confidential responses to the March Consultation and June update, a number of broadcasters, included estimates of what they believed their revenue at risk numbers would be.

6.16 Ofcom has looked at these estimates and compared them to our own estimates. Ofcom compared the pre-mitigation estimates to abstract from differences due to different mitigation percentages.

6.17 Each of Packages 1-3 and the pre-9pm option has been assessed for those broadcasters who submitted estimates. For Packages 1 and 2, apart from one broadcaster[38], the estimates were similar or the differences were easily explained (for example one broadcaster had included supermarket expenditure which was excluded from the Ofcom analysis).

[35] The FAU employed Cassidy Media Partnership to undertake the data analysis of Option 4.
[36] A weighted impact takes account of the length of the advert as well as the number of times it is shown, while un-weighted impacts simply records the number of times the advert is shown.
[37] The FAU have not calculated the effect for Package 1 or the 120 index part of Package 2
[38] This was due to weekday vs weekend effects.

6.18 For Package 3, the estimates were reasonably similar to those of the broadcaster's, however there were a couple of exceptions. Part of this difference could be explained by differences in modelling, for example those broadcasters spilt out weekday and weekend viewing in their analysis.

6.19 The comparisons for the pre-9pm option were similar to Package 3. For some broadcasters the estimates appear comparable, but again there were a couple of exceptions. Differences in modelling, for example using actual spot values rather than Nielsen estimates explain part of this difference.

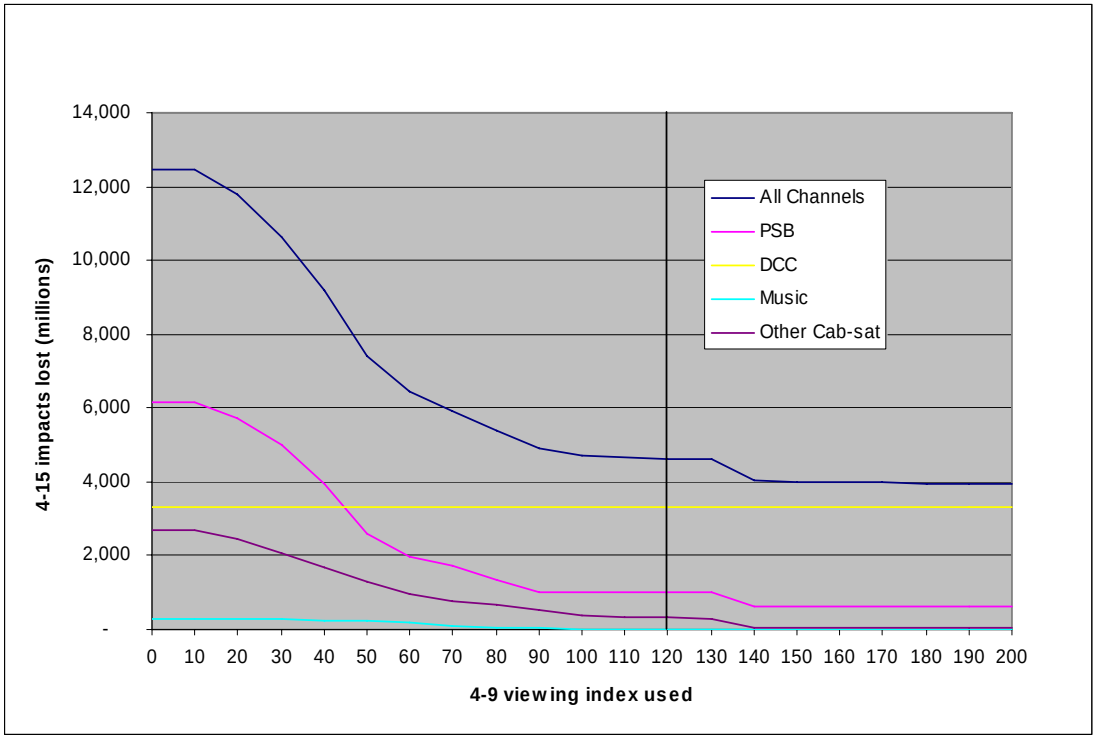
6.20 Given the inevitable differences between estimates based on different modelling approaches, Ofcom believes that our modelled estimates are consistent with those provided by the FAU and the broadcasters' estimates of the effects on their own businesses.

Analysis of the Robustness of the Viewing Index Threshold

6.21 Ofcom has undertaken further modelling work to understand the difference that varying the level of the child viewing index threshold (which is used to identify programmes of particular appeal to 4-9 or 4-15 year old children) would make to the HFSS impacts lost and the subsequent financial impact on broadcasters (the children's programming restriction means that the restrictions on DCCs are not affected by the viewing index).

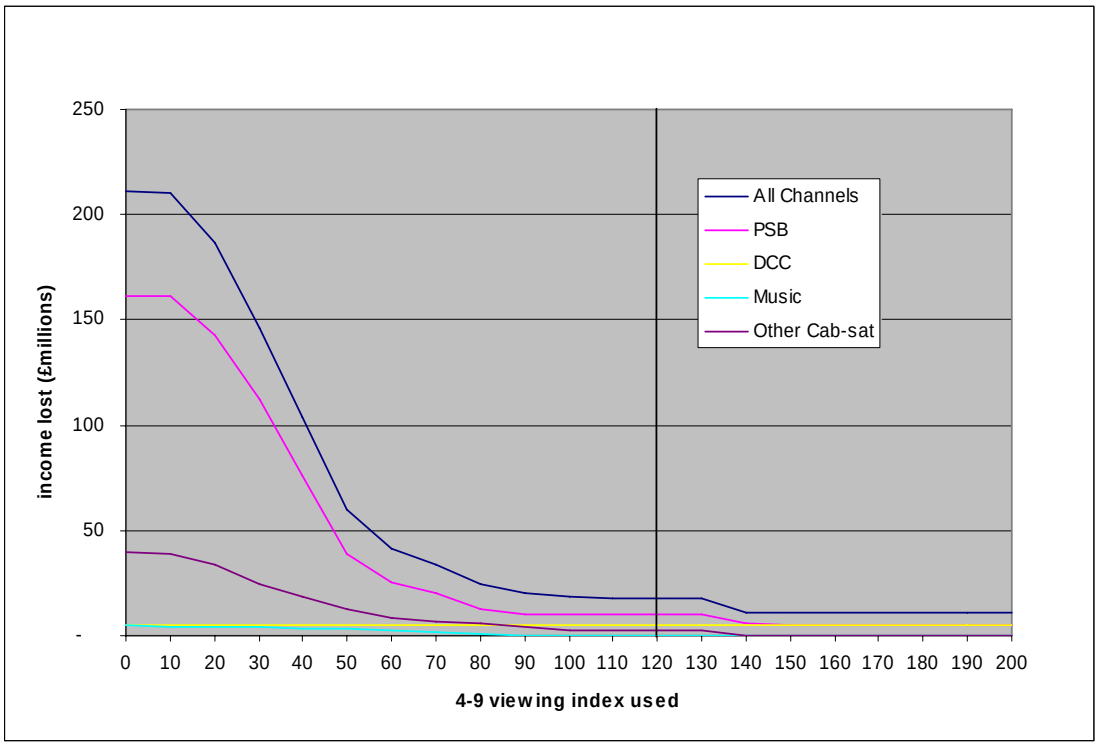
6.22 The primary reason for choosing an index threshold of 120 is that this is consistent with the restrictions already in place for adverts for alcohol and gambling. However to test the robustness of the choice, Ofcom has analysed the effect for Package 1 of using different thresholds in the child viewing index on the reduction in (4-15) child impacts and the estimated revenue loss.

Figure 6.3: Reduction in impacts from Package 1 from varying the viewing index threshold



6.23 The flatness of the graphs around an index of 120 on Figure 10 indicates that there are almost no programmes which index between 90 and 130. Therefore reducing the index threshold from 120 to 90 (or increasing it to 130) would have no material effect on the number of HFSS impacts restricted. This suggests a polarisation in programming between programmes which are aimed at general audiences (which attract a low proportion of children) and programmes which are particularly attractive to children (and which attract largely child audiences). It confirms that the impact analysis is robust to fairly large changes in the choice of the index threshold.

Figure 6.4: Estimated revenue loss from Package 1 from varying the viewing index threshold



6.24 Figure 6.4 above shows the estimated revenue loss to broadcasters of using different child index thresholds in Package 1. As discussed above, the absence of programmes scoring a child index between 90 and 130 leads to this part of the revenue loss graph also being very flat (it is only when the index restriction is tightened to 70 or below that steep revenue losses occur for the broadcasters). This confirms that the analysis of estimated loss of revenue of revenue is robust to fairly large changes in the choice of index threshold.

Conclusion

6.25 These pieces of analysis when taken together provide confidence that the estimates generated by the model are consistent with alternative approaches and sufficiently robust to be used to estimate the impact on broadcasters of advertising restrictions to support policy decisions relating to restrictions on advertising and sponsorship on commercial television.

IA Section 7

Results of the analysis of the impact on broadcasters

Introduction

7.1 This section sets out the results of Ofcom's analysis of the impact on broadcasters of the policy options in terms of the reduction in HFSS impacts, the effect on broadcasters' revenues and the relative efficiency of the various options.

Reduction in HFSS Impacts

7.2 One of Ofcom's regulatory objectives is to reduce significantly the exposure of younger and older children to HFSS advertising, between 2003 (when the Secretary of State announced the Government's decision to review the codes on food and drink advertising) and 2005 (the base year for this analysis) there was an18% reduction in 4-15 HFSS impacts and a 21% reduction in 4-9 HFSS impacts. Tables 7.1 and 7.2 and Figure 7.1 below set out the reductions in 4-9 and 4-15 year old HFSS impacts stemming from each of the packages[39] compared to a 2005 base year. In this analysis we have separated out music channels from the previous "other cab-sat" category as the use of a 4-15 index in Modified Package 1 and Options 5 and 6 implies a significant increase in the impact on these channels.

Table 7.1: Reduction in HFSS (4-9 yr olds) impacts by policy option

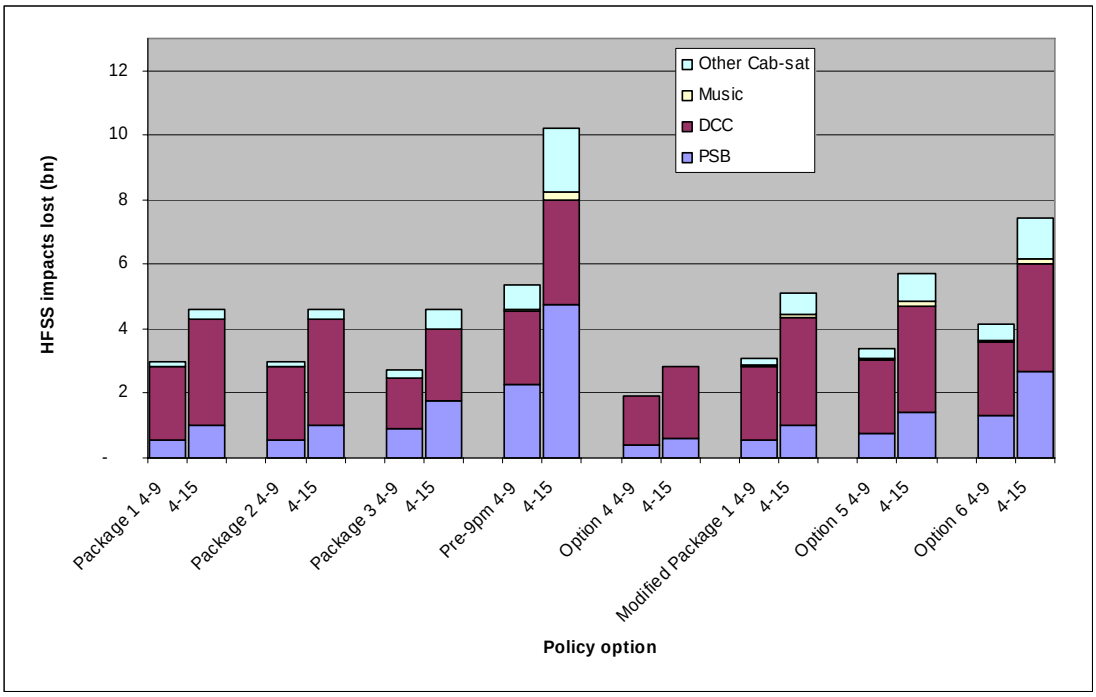
Type of Channel	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	49%	49%	44%	89%	30%	51%	56%	68%
PSB	21%	21%	34%	85%	14%	20%	28%	49%
DCC	100%	100%	69%	98%	68%	100%	100%	100%
Music	2%	2%	16%	84%	0%	41%	47%	57%
Other Cab-sat	15%	15%	22%	77%	0%	22%	31%	48%

Table 7.2: Reduction in HFSS (4-15 yr olds) impacts by policy option

Type of Channel	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	37%	37%	36%	82%	21%	41%	46%	60%
PSB	16%	16%	28%	78%	10%	17%	23%	44%
DCC	100%	100%	67%	97%	67%	100%	100%	100%
Music	1%	1%	15%	80%	0%	44%	49%	56%
Other Cab-sat	12%	12%	22%	73%	0%	23%	32%	47%

[39] Note there is a small change to the percentages shown compared to those reported in the June update due to the reclassification of Trouble and GMTV2.

Figure 7.1: Reduction in HFSS impacts by policy option



7.3 Tables 7.1 and 7.2 and Figure 7.1 show that:

- All the policy options (except Package 3 and Option 4) imply a complete (or near complete) removal of HFSS impacts from DCCs (with a two-thirds reduction for Package 3 and Option 4)
- The pre-9pm ban implies very significant impact reductions across all categories
- Modified Package 1 and Options 5 and 6 imply significant reductions in impacts for music and other cab-sat channels
- Option 6 in particular (but also Option 5) implies significant impact reductions across all categories
- Option 4 has a much lower effect in reducing impacts than other policy measures

The Effect on Revenues

7.4 Another of Ofcom's regulatory objectives is to avoid disproportionate impacts on the revenues of broadcasters. The revenues that Ofcom estimates may be at risk (before mitigation) to broadcasters from the imposition of each of the packages are as follows:

Table 7.3: Estimate of revenue at risk (£m pa) by policy option*

Type of Channel	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	31.3	36.5	96.9	263.2	18.9	38.6	66.6	142.1
PSB	19.8	23.6	76.8	206.1	14.5	20.7	41.9	106.6
DCC	6.6	7.1	4.7	6.3	4.4	6.6	6.6	6.6
Music	0.1	0.1	1.2	6.4	0.0	3.0	3.4	4.2
Other Cab-sat	4.9	5.8	14.3	44.4	0.0	8.3	14.7	24.7

*This excludes the impact on channels licensed in the UK broadcasting to overseas markets (see paragraphs 3.28-3.32)

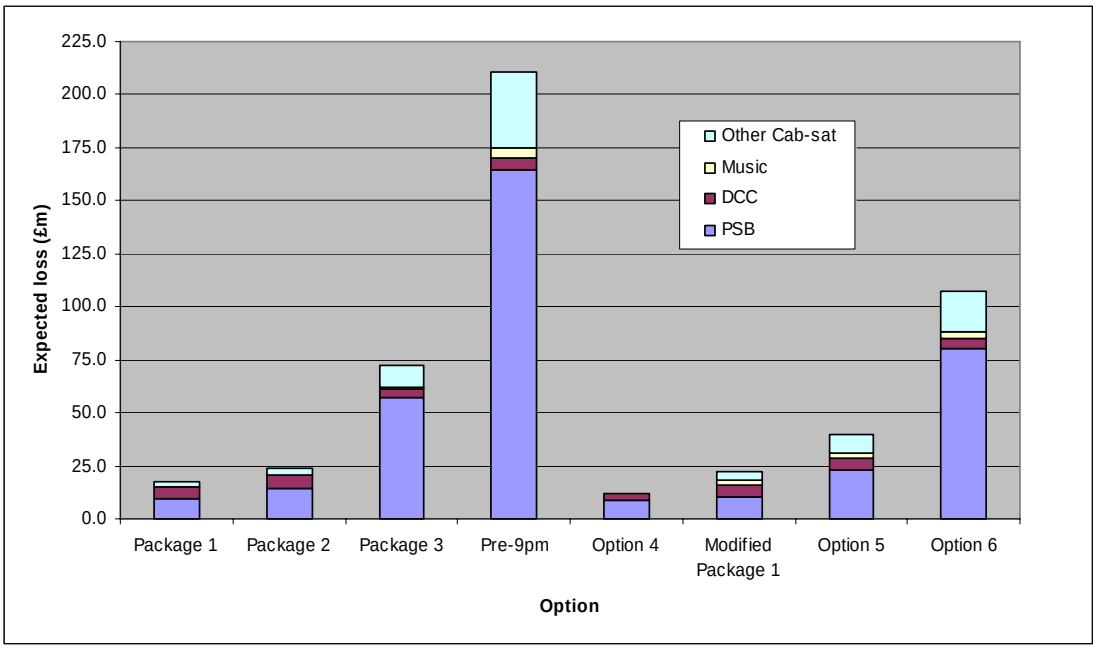
7.5 Applying the mitigation factors in Table 5.2 to this revenue at risk gives the estimated loss of revenue for each package shown in Table 7.4 and Figure 7.2.

Table 7.4: Estimate of revenue loss by policy option (£m pa)*

Type of Channel	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	17.6	24.0	72.7	210.5	12.0	22.6	39.5	107.2
PSB	9.9	14.1	57.6	164.9	8.7	10.4	23.1	80.0
DCC	5.2	6.4	3.5	5.1	3.3	5.2	5.2	5.2
Music	0.0	0.1	0.9	5.1	0.0	2.4	2.7	3.4
Other Cab-sat	2.4	3.5	10.7	35.5	0.0	4.6	8.4	18.6

* This excludes the impact on channels licensed in the UK broadcasting to overseas markets (see paragraphs 3.28-3.32)

Figure 7.2: Estimate of revenue loss by policy option*



* This excludes the impact on channels licensed in the UK broadcasting to overseas markets (see paragraphs 3.28-3.32)

7.6 Table 7.4 and Figure 7.2 show:

- The effect of Package 1, the pre-9pm ban, Modified Package 1 and Options 5 and 6 on children's channels is the same (since they are not affected by the change in viewing index);
- The bulk of the estimated revenue loss is from PSBs;
- The pre-9pm ban leads to the largest revenue loss followed by Option 6 and Package 3;
- The music channels are not generally affected by Packages 1, 2 and 3 or Option 4, but would be affected by Modified Package 1, Options 5 and 6 and the pre-9pm ban;
- Option 4 leads to the lowest estimated revenue loss; and
- Options 5 and 6 have a larger impact than Package 1 due to the restriction on advertising in the early evening and the use of the 4-15 index.

7.7 Broadcasters' ability to absorb these losses in revenue depends to a large extent on their size. Table 7.5 below shows the estimated average loss of revenue as a proportion of total revenue by channel type.

Table 7.5: Average loss of revenue as a share of total revenue by channel category

Type of Channel	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	0.3%	0.4%	1.2%	3.5%	0.2%	0.4%	0.6%	1.8%
PSB	0.3%	0.5%	1.9%	5.4%	0.3%	0.3%	0.8%	2.6%
DCC	4.7%	5.7%	3.2%	4.6%	3.0%	4.7%	4.7%	4.7%
Music	0.0%	0.0%	0.7%	4.0%	0.0%	1.9%	2.2%	2.7%
Other Cab-sat	0.1%	0.1%	0.4%	1.3%	0.0%	0.2%	0.3%	0.7%

7.8 Table 7.5 shows that:

- All policy options (apart from the pre-9pm ban) have the largest proportionate impact on children's channels;
- The impact of the pre-9pm ban is much higher than all other options for all types of channel (apart from the children's channels who face a total ban on HFSS advertising under all scheduling options);
- Modified Package 1 and Options 5 and 6 would have a much more significant effect on music channels than would Packages 1, 2 or 3; and
- Option 4 would have the lowest effect of any policy option for all channels.

7.9 However even within channel categories there was quite a skewed distribution of effects, with significant variation between channels in the impact of the different policy measures. Tables 7.6 and 7.7 below show the highest estimated percentage revenue loss for an individual channel in each

category and the number of channels with more than 5% revenue loss in each category.

Table 7.6: Highest percentage loss of revenue in each category

Type of Channel	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	15.3%	18.5%	12.3%	15.3%	12.3%	15.3%	15.3%	15.3%
PSB	0.6%	0.8%	7.1%	9.6%	1.7%	0.7%	1.4%	2.9%
DCC	15.3%	18.5%	12.3%	15.3%	12.3%	15.3%	15.3%	15.3%
Music	0.3%	0.4%	6.8%	13.9%	0.0%	8.8%	8.8%	9.3%
Other Cab-sat	2.4%	3.2%	3.4%	6.3%	0.0%	6.3%	6.3%	6.3%

Table 7.7: Number of channels with a revenue loss of more than 5%

Package	Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
All Channels	**4**	**6**	**6**	**24**	**2**	**9**	**9**	**11**
PSB	0	0	1	2	0	0	0	0
DCC	4	6	2	4	2	4	4	4
Music	0	0	3	12	0	4	4	6
Other Cab-sat	0	0	0	6	0	1	1	1

7.10 Tables 7.6 and 7.7 show that:

- The channel with the highest proportionate revenue loss in a category is estimated to lose significantly more than the average for that channel category;
- For Packages 1 and 2, the pre-9pm ban, Modified Package 1 and Options 5 and 6, while the average revenue loss is of the order of 5%, some channels would face losses of over 15%;
- The inclusion of all food and drink advertising under Package 2 would cause an extra two channels to face an estimated revenue loss of more than 5% compared to Package 1.
- The use of a 4-15 index (Modified Package 1) rather than 4-9 (Package 1) would cause five extra channels (four music and one other cab-sat) to face an estimated revenue loss of more than 5%; and
- Modified Package 1 and Options 5 and 6 would all have a significant impact on certain music and children's channels – with 4 channels in each category (6 for music channels under Option 6) facing an estimated revenue loss of more than 5%.

The Efficiency of the Policy Options

7.11 A further Ofcom regulatory objective is to avoid intrusive regulation of advertising during adult airtime, given that adults are able to make informed decisions about advertising messages.

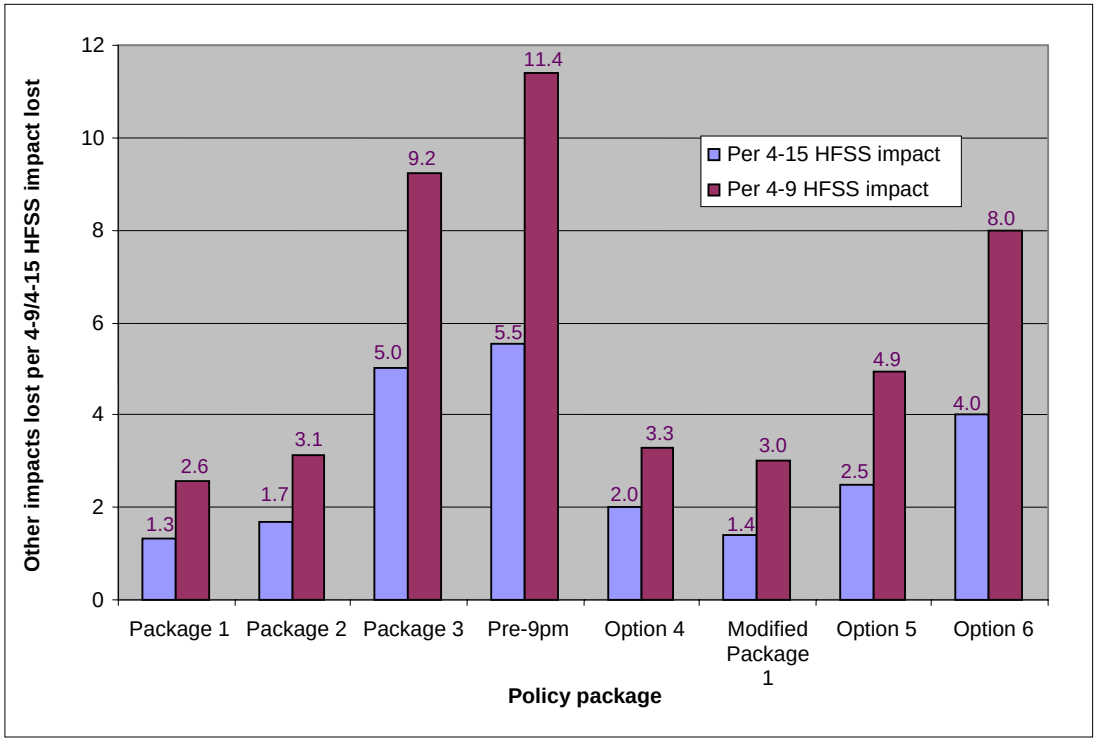
7.12 Table 7.8 and Figure 7.3 below show the number of adult impacts and non-HFSS child impacts (i.e. the impacts that do not contribute towards the regulatory objective) that are restricted for each HFSS child impact (4-9 and 4-15) for each policy option.

Table 7.8: Efficiency of the different policy options

	Efficiency (other impacts lost per 4-15 HFSS impact lost)	Efficiency (other impacts lost per 4-9 HFSS impact lost)
Package 1	1.3	2.6
Package 2	1.7	3.1
Package 3	5.0	9.2
Pre-9pm ban	5.5	11.4
Option 4	2.0	3.3
Modified Package 1	1.4	3.0
Option 5	2.5	4.9
Option 6	4.0	8.0

Note: Lower numbers imply more efficient options

Figure 7.3: Efficiency of the different policy options



7.13 The least 'efficient' or targeted options are the pre-9pm ban, Package 3 and Option 6 where in each case 4 or more adult and 4-15 non-HFSS impacts are

restricted per 4-15 HFSS impact (8 or more impacts restricted per 4-9 child impact lost). This inefficiency stems from the restrictions affecting channels and times where there are proportionately few children watching. In addition Packages 2 and 3 and Option 4 are less efficient since they do not include nutrient profiling and therefore restrict non-HFSS child impacts.

7.14 The packages with the greatest efficiency are Packages 1 and 2, Modified Option 1 and Option 4. These are targeted much more specifically at restricting advertising at times when children (but not necessarily adults) are most likely to be watching.

7.15 Ofcom undertook further analysis which examined in detail the absolute level of HFSS impacts by time-slot and channel. This showed that the highest absolute number of children's impacts is in early evening on PSBs, followed by other times on PSBs and then DCCs, followed by specific channels (eg E4, ITV2 and Sky1). We compared this to a detailed analysis of the ratio of adult impacts to child impacts (also by channel and time-slot) which showed that the PSBs have relatively low numbers of children watching for every adult watching (similar to those for many cab-sats) while the DCCs have by far the highest ratio followed by music channels and then the Sky movie channels.

7.16 This comparison highlighted the issue that while early evening (especially PSB) programmes tend to have large numbers of children watching them, they also have proportionately much larger adult audiences. As a result, the policies which restrict these timeslots (Options 5 and 6 and the pre-9pm ban) are generally inefficient and have a much larger estimated revenue loss (compared to for example Modified Package 1 which shares the other policy elements with these options).

Impact on Advertising Agents' Commission

7.17 As discussed in the March IA (paragraph 9.13), advertising agencies earn commission on advertising expenditure. Thus if advertising expenditure were to fall, then there would be a loss of revenue to advertising agencies. Agencies receive a notional commission of 15% of advertising spend, however in practice the actual commission rate received is significantly lower than this. Therefore Table 7.9 below gives an upper bound on the impact on advertising agencies.

Table 7.9: Upper Bound for Impact on Advertising Agents' Commission (£m pa)

Package 1	Package 2	Package 3	Pre-9pm Ban	Option 4	Modified Package 1	Option 5	Option 6
3.1	4.2	12.8	37.2	2.1	4.0	7.0	18.9

Note: Calculated from estimated revenue loss in Table 7.4

IA Section 8

Analysis of Benefits

Introduction

8.1 The benefits of the policy packages in the March IA and June update were based on an assessment carried out by the Food Standards Agency (FSA) in conjunction with the Department of Health (DH) of the benefits from reduced obesity, strokes, coronary heart disease and cancer of changes to diets resulting from the policy proposals. This analysis was set out in full in Annex C of the March IA and summarised in Section 8 of that document. It uses two methodologies for valuing the potential lives saved from these policy measures – value of life (VOL) based on the Department for Transport's valuation of lives saved in road accidents and Quality Adjusted Life Years (QALYs) based on the value people place on quality and quantity of life.

8.2 As discussed in the March IA, Ofcom has no expertise in nutrition or health related areas. We have therefore relied on the assessment of benefits carried out by the FSA (the body with the relevant expertise to make this assessment) in conjunction with the DH. The full FSA analysis is included as Annex A to this impact assessment.

Summary of responses

8.3 Ofcom received a substantive response to the FSA analysis from the Food and Drink Federation (FDF) and also received some detailed comments from Angie Jefferson (an independent dietitian) and the British Nutrition Foundation (BNF)[40]. These comments have been discussed in detail with the FSA.

8.4 Ofcom sets out below a summary of the main issues raised by the respondents and a summary of the rebuttal from the FSA. The full rebuttal of the FSA to the FDF response can be found in Annex B to this impact assessment. The FSA's response to comments raised by Angie Jefferson is set out in Annex C to this impact assessment.

FDF Response and FSA Response

Bolton/Grossman Analysis

8.5 The FDF stated that although two studies – Bolton and Grossman et al – were discussed, the evidence from them was not used and that a model based on assumed levels of food substitutions was developed separately and is not supported by the Bolton paper.

FSA Response

8.6 The FSA state that the FDF have not correctly understood the model that they (the FSA) had developed. The FSA state that for illustrative purposes they have discussed what would happen in the event of a 100% substitution rate. However, throughout their analysis they have indicated that a 10% rate is a

[40] These have been published on the Ofcom website http://www.ofcom.org.uk/consult/condocs/foodads/responses/

more realistic event and the base case numbers use this percentage[41]. Thus the numbers quoted in the FDF response are incorrect.

8.7 The FSA state that the methodology set out in Grossman's analysis differs from the dose response function approach adopted by the FSA and so a fuller discussion of Grossman et al's analysis was not appropriate. However Grossman et al's views were reflected in the benefit assessment paper.

Quebec and Swedish Experience

8.8 The FDF state that the analysis barely mentions two important real life experiments – the Quebec and Swedish experiences.

FSA Response

8.9 The FSA agree that inclusion of reference to both of these experiences should be included in the benefits assessment and that this has been amended accordingly. In addition the FSA reference Goldberg[42] who concluded that in Quebec, the law had appeared to influence the consumption of children's sweetened breakfast cereal. The FSA have also stated that their modelling has stressed the importance of wider nutrient intakes and not simply calorie reduction.

Food Substitution Model

8.10 The FDF state that there is no evidence provided in the benefits analysis that suggests it is realistic to assume that food substitution would occur at all. The FDF also state that there is no evidence to suggest that the foods being substituted are realistic. The FDF go on further to question the evidence behind the scale of substitution and argue that no attempt has been made to use the Bolton and Grossman evidence. They also state that the key driver in the benefits analysis is the increased fruit intake that would occur due to substitution, however they state that this threefold increase in fruit intake is not realistic. The FDF say that their single most important criticism is based on the assumptions regarding policy effectiveness and the 10% figure used.

FSA Response

8.11 The FSA quote from Bolton suggesting that not only is the nutrient value of what children eat on average being reduced by increased snacking, but that television food advertising is also acting to make children's diets less nutritious as they substitute towards low-nutrient foods even when not snacking. This message, the FSA state lends support to its approach to modelling dietary substitutions.

8.12 Regarding the foods that might be substituted, the FSA point out that as the policy has yet to be introduced it is not possible to provide robust evidence on its exact effects. However, the substitutes used are based on those products that would be able to advertise should the Nutrient Profiling Model be employed and are regarded as sensible by FSA nutritionists.

[41] The FSA also discuss the reason why they believe that a 10% substitution rate is realistic in their full response included at Annex B to this impact assessment.
[42] Goldberg, M.E. A quasi-experiment assessing the effectiveness of TV advertising directed to children. Journal of Marketing Research. 1990; XXVII, p445-54.

8.13 On the scale of substitution, the FSA repeat the point that the modelling was largely inspired by Bolton and the more generalised views of Hastings and Livingstone and that Grossman's methodology was different to this. They also point out that Bolton shows an average of three less weekly snacking events given a total restriction, but that the FSA's base case for a total restriction would only yield a reduction of less than one Bolton snack in calorie terms.

8.14 On fruit substitution, the FSA discuss a study conducted by Horne et al which shows that considerable uplifts in intake in fruit could be achieved, although the study was looking at positive messaging rather than a restriction. The FSA also point out that at a 10% policy effectiveness this equates to approximately a 10g daily increase in fruit consumption and that only half of this is mapped into adulthood at the monetisation stage.

8.15 The FSA consider a 10% base case for the policy effect to be consistent with a conservative interpretation of Bolton's work and that given the information constraints of tracking individual diets through life, the base case is aimed at illustrating an average 10% dietary substitution across the child population.

Obesity Dose Response Function

8.16 The FDF argue that there are a number of problems with the obesity dose response function. It is applied assuming that a "steady state" is in place before intervention, which they state is incorrect for those children who are becoming increasingly obese. In addition the function's values for the basal metabolic rate and exercise level are set to national average values, which are likely to be incorrect for children who are already obese and that it assumes that every child of a particular weight will achieve exactly the same calorie reduction via food substitution.

FSA Response

8.17 The FSA point out that those children who have not reached a steady state will do so at some point and the reductions in calorie intake envisaged will reduce the steady state BMI which they will eventually attain. In terms of the use of population average values, the FSA state that they are not aware of any data on individual variation and agree that for some children their weight will not fall as much as the average but conversely there are those children where it will fall more than the average. In terms of using averages, this is the only practical way of conducting the analysis.

Impact on Mortality and Morbidity

8.18 The FDF state that for the effects of sugar via obesity there seems to be a disconnect between the FSA and the DH analysis, in that the DH calculations use two different mortality risk increases to apply to obesity which give different answers in terms of lives saved to the FSA's.

8.19 The FDF believe that because the analyses on salt, saturated fat, sugar and increased fruit consumption have been done independently, this is an overestimation of the CHD death effects and that double counting has occurred. They also point out that if fewer people die of CHD then they will have more chance of developing competing illnesses such as Alzheimer's.

FSA Response

8.20 The FSA state that there is no disconnect and that the FSA use the more conservative of the two deaths averted estimates, but the figures used are based on the England birth cohort and thus have been uplifted in order to relate to the whole of the UK.

8.21 The FSA state that for salt and fat there may be some double counting but it is likely to be extremely small (around 1%). Further with regard to fruit consumption averting deaths then there is no double counting as the FSA have only looked at cancer deaths, not CHD related deaths. In terms of competing risk this is inherent in all estimates of lives saved - in all cases people at risk would have died anyway from some cause, so deaths are not really saved merely postponed.

QALY v VoL

8.22 The FDF believe that QALY is the appropriate measure to use, because this methodology has more credibility in economic decision making in the public health arena than the VoL approach. For example NICE guidance favours the QALY approach, as do other reimbursement agencies internationally.

FSA Response

8.23 The FSA accepts the FDF's comments, but does not consider it appropriate to finally conclude that the traditional use of QALYs is the correct monetising tool here (see Annex B to this impact assessment). This is based on the growing understanding of researchers[43] that in empirical Willingness to Pay (WTP) studies most people exhibit a "pure value of living" per se which is not trivial. As using traditional money values for QALYs will fail to capture this effect (whereas it is reflected in the VoL estimates), the FSA considers it best to continue to report both the QALY and WPT/VoL monetised figures.

Mapping through to adulthood assumption

8.24 The FDF state that there is no evidence to suggest why a 50% mapping through to adulthood ratio is used.

FSA Response

8.25 The FSA believe this to be a sensible base case taking into account the evidence that exists in tracking childhood consumption of the wider nutrient categories coupled with a 70% figure of adolescent obesity tracking into adulthood.

Angie Jefferson et al Response

8.26 A number of the questions raised by Angie Jefferson (an independent dietician) et al have been covered in the summary above of the FDF response, for example the replacement of snacks with fruit and are not repeated here.

[43] The FSA quote comments by Prof. Michael Jones-Lee (University of Newcastle upon Tyne Business School) on this subject.

8.27 However Angie Jefferson et al also noted that although product reformulation is encouraged in order for food products to continue to be allowed to appear, there may be two nutritional intake effects.

FSA Response

8.28 The FSA agree that if switching to reformulated foods which are less nutritious than the original substitutions assumed occurs, then the health benefits would be lower. However, the FSA base case only envisages a couple of weekly meal substitutions, thus with the systematic nutrient improvement of recipes, ingredients etc that reformulations may bring, it is likely that this will have a large dietary health impact across the number of other meal times where the FSA is not considering substitution. They therefore expect that this effect would be the dominant factor.

BNF Response

8.29 A number of the questions raised by the BNF have been covered in the summary above of the FDF response, for example the use of the Quebec and Swedish experiences, the replacement of snacks with fruit, the issue of double counting etc. and these have not been repeated.

8.30 The BNF stated that the modelling used apples and bananas which are types of fruit not particularly rich in vitamin C, yet the associated modelling of cancer deaths attributable to the assumed increase in fruit consumption is based on finding from EPIC showing an inverse association between cancer risk and vitamin C.

FSA Response

8.31 The FSA state that the inclusion of vitamin C rich fruits such as oranges, would not significantly affect the fruit weight substitutions reported and used to illustrate the cancer benefits.

Estimate of Benefits of Policy Options

8.32 The modelling and benefits reported by the FSA has not been affected by these comments and their central case assessment of the benefit to children's health of removing **all** HFSS adverts from TV remains unchanged at **£605m pa for VoL** and **£125m pa for QALY**.

8.33 However between 2003 (when the Secretary of State announced the Government's decision to review the codes on food and drink advertising) and 2005 (the base year for this analysis) there was an 18% reduction in (4-15 year old) HFSS impacts. Therefore Ofcom has adjusted the FSA estimate down by 18% to reflect the benefits of the reduction in HFSS adverts that occurred in this period. This estimate is then (as in the March IA) scaled down by the proportion of impacts affected by each policy measure to give the estimated benefit for the policy measure[44]. As discussed in the March IA (paragraphs 8.35 – 8.36) the FSA analysis does not specifically measure the benefits of policies (Packages 2 and 3 and Option 4) that restrict all food and drink advertising, however Ofcom continues to believe (for the reasons set out in paragraph 8.35 of the March IA) that the benefits of such policies would

[44] This assumes that the relationship between the reduction in impacts and benefits is linear.

be close to, but lower than the estimated benefits of the package were it to restrict solely HFSS adverts.

8.34 Table 8.1 below summarises the estimates of the monetised benefits of each policy option considered.

Table 8.1: Total discounted benefits for each policy option for 2005

Option	% 4-15 Impact Reduction	QALY (£m pa)			VoL (£m pa)		
		Low	Central	High	Low	Central	High
Package 1	37%	19	38	76	92	184	368
Package 2	37%	<19	<38	<76	<92	<184	<368
Package 3	36%	<19	<37	<74	<90	<179	<359
Pre-9pm Ban	82%	42	84	168	203	406	811
Option 4	21%	<11	<22	<44	<53	<106	<211
Mod Package 1	41%	21	42	84	101	203	405
Option 5	46%	24	47	94	114	228	457
Option 6	60%	31	61	122	148	296	592

Note: FSA's estimates adjusted to a 2005 base year and to reflect the number of impacts likely to be restricted by each policy option. The costs of policies restricting all food and drink are expected to be close to, but lower than those for the equivalent HFSS package.

IA Section 9

Summary of Proposed Policy Options

Introduction

9.1 This Impact Analysis has estimated the costs (Section 7) and the benefits (Section 8) of a range of policy options for restricting either HFSS or all food and drink advertising on commercial television channels.

9.2 This section brings together the analysis relating to the different policy options. It does not repeat general comments (e.g. the impact on advertising agencies, original programming or food and drink manufacturers, the risk of UK channels moving overseas, implementation issues etc) that are common to the general question of advertising restrictions and are considered elsewhere in this IA.

Do nothing / voluntary restrictions

9.3 Ofcom considered a 'do nothing' option of relying on voluntary restrictions in the March consultation and June update and considered that this would not meet our regulatory objectives. Ofcom continues to believe that:

- While core category advertising has fallen by 18% since 2003, it could take a long time to achieve the reduction in HFSS child impacts likely under the other policy options considered;
- The actions of different advertisers vary significantly and it is unlikely that voluntary measures would provide consistent and effective action;
- There is no guarantee that recent improvements would continue without the threat of regulation; and that
- Existing content regulation does not prevent advertisers using a range of techniques to make HFSS foods more attractive to children.

Package 1

9.4 This package would exclude all advertising and sponsorship of HFSS foods during programmes made for children and during programmes which are of particular interest to 4-9 year old children. It would also include the BCAP content restrictions. The scheduling restrictions on children's channels would be phased in over three years.

Table 9.1: Summary of the Impact of Package 1

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Estimated revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**49**	**37**	**13.3**	**17.6**	**20.8**	**0.3%**	**15.3%**
PSB	21	16	6.9	9.9	11.9	0.3%	0.6%
DCC	100	100	4.6	5.2	5.9	4.7%	15.3%
Music	2	1	0.0	0.0	0.0	0.0%	0.3%
Other Cab-sat	15	12	1.7	2.4	2.9	0.1%	2.4%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
			QALY			VOL		
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	Low	Central	High	Low	Central	High
4	**1.3**	**2.6**	**19**	**38**	**76**	**92**	**184**	**368**

9.5 Table 9.1 above shows that Package 1 would lead to a **49%** or **37%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **2.6** or **1.3** other impacts respectively would be restricted.

9.6 It would have an estimated cost of **£13.3m - £20.8m pa** compared to an estimated benefit of **£19m – £76m pa** (QALY) or **£92m – £368m pa** (VoL). Just over half of this cost (£6.6m - £11.9m pa) would fall on PSBs which would account for about 0.3% of their revenues. The cost to children's channels would be just under **5% of their total revenues** with one children's channel estimated to lose **over 15% of its total revenue**. Four channels are estimated to lose more than 5% of their revenue.

9.7 As a package that uses nutrient profiling, it is targeted on the regulatory objective of reducing the exposure of children to HFSS advertising and would provide an incentive to promote non-HFSS food and drinks and to innovate, but there may be some operational issues to be addressed in implementing the FSA model.

Package 2

9.8 This package would exclude all advertising and sponsorship of food and drink during programmes made for children and during programmes which are of particular interest to 4-9 year old children. It would also include the BCAP content restrictions.

Table 9.2: Summary of the Impact of Package 2

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Estimated revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**49**	**37**	**20.7**	**24.0**	**27.3**	**0.4%**	**18.5%**
PSB	21	16	11.8	14.1	16.5	0.5%	0.8%
DCC	100	100	6.0	6.4	6.7	5.7%	18.5%
Music	2	1	0.0	0.1	0.1	0.0%	0.4%
Other Cab-sat	15	12	2.9	3.5	4.0	0.1%	3.2%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
6	**1.7**	**3.1**	**<19**	**<38**	**<76**	**<92**	**<184**	**<368**

9.9 Table 9.2 above shows that Package 2 would lead to a **49%** or **37%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **3.1** or **1.7** other impacts respectively would be restricted.

9.10 It would have an estimated cost of **£20.7m - £27.3m pa** compared to benefits that are estimated to be close to but less than those for Package 1[45] which are **£19m – £76m pa** (QALY) or **£92m – £368m pa** (VoL). Almost 60% of this cost (£11.8m - £16.5m pa) would fall on PSBs which would account for about 0.5% of their revenues. The cost to children's channels would be almost **6% of their total revenues** with one children's channel estimated to lose **over 18% of its total revenue**. Six channels are estimated to lose more than 5% of their revenue.

9.11 As a package that does not include nutrient profiling, it would be more straightforward for broadcasters and manufacturers to implement and could readily be extended to cover brand advertising. However there would be less scope for broadcasters to mitigate the resulting revenue loss and manufacturers would have less incentive to reformulate their products or innovate.

Package 3

9.12 This package would exclude all advertising and sponsorship of food and drink during pre-school children's programmes together with volume restrictions limiting advertising to 30/60 seconds per clock hour at times when children are generally viewing television in large numbers. It would also include the BCAP content restrictions.

[45] Since the benefits of a restriction on all food and drink advertising is expected to be close, but lower than a restriction on HFSS advertising – see paragraph 8.33.

Table 9.3: Summary of the Impact of Package 3

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Estimated revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**44**	**36**	**58.4**	**72.7**	**77.8**	**1.2%**	**12.3%**
PSB	34	28	46.1	57.6	61.4	1.9%	7.1%
DCC	69	67	3.0	3.5	4.0	3.2%	12.3%
Music	16	15	0.7	0.9	1.0	0.7%	6.8%
Other Cab-sat	22	22	8.6	10.7	11.5	0.4%	3.4%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
6	**5.0**	**9.2**	**<19**	**<37**	**<74**	**<90**	**<179**	**<359**

9.13 Table 9.3 above shows that Package 3 would lead to a **44%** or **36%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **9.2** or **5.0** other impacts respectively would be restricted.

9.14 It would have an estimated cost of **£58.4m - £77.8m pa** compared to benefits that are estimated to be close to but less than those for an equivalent HFSS package[46] which are **£19m – £74m pa** (QALY) or **£90m – £359m pa** (VoL). Almost 80% of this cost (£46.1m - £61.4m pa) would fall on PSBs which would account for about 1.9% of their revenues and **over 7%** of one of these channels' revenues. The cost to children's channels would be just over 3% of their total revenues with one children's channel estimated to lose over **12% of its total revenue** and one music channel estimated to lose **almost 7% of its total revenue**. Six channels are estimated to lose more than 5% of their revenue.

9.15 As a package that does not include nutrient profiling, it would be more straightforward for broadcasters and manufacturers to implement and could readily be extended to cover brand advertising. However there would be less scope for broadcasters to mitigate the resulting revenue loss and manufacturers would have less incentive to reformulate their products or innovate.

9.16 The use of volume restrictions in this package would be complicated to implement and more difficult to monitor and ensure compliance with than for scheduling restrictions. They would also allow some HFSS advertising in programmes made for children and during programmes of particular appeal to children. There was little support for this option across the consultation responses.

Pre-9pm ban

9.17 This policy would exclude all advertising and sponsorship of HFSS foods between 6am and 9pm. It would also include the BCAP content restrictions.

[46] Since the benefits of a restriction on all food and drink advertising is expected to be close, but lower than a restriction on HFSS advertising – see paragraph 8.33.

Table 9.4: Summary of the Impact of a Pre-9pm ban

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Estimated revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**89**	**82**	**184.2**	**210.5**	**224.4**	**3.5%**	**15.3%**
PSB	85	78	144.3	164.9	175.2	5.4%	9.6%
DCC	98	97	4.4	5.1	5.7	4.6%	15.3%
Music	84	80	4.5	5.1	5.7	4.0%	13.9%
Other Cab-sat	77	73	31.1	35.5	37.8	1.3%	6.3%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
24	**5.5**	**11.4**	**42**	**84**	**168**	**203**	**406**	**811**

9.18 Table 9.4 above shows that a pre-9pm ban would lead to a **89%** or **82%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **11.4** or **5.5** other impacts respectively would be restricted.

9.19 It would have an estimated cost of **£184m - £224m pa** compared to an estimated benefit of **£42m – £168m pa** (QALY) or **£203m – £811m pa** (VoL). Almost 80% of this cost (£144m - £175m pa) would fall on PSBs which would account for about **5.4%** of their revenues and **9.6%** of one of these channel's revenues. The cost to children's channels and music channels would be **4 to 5% of their total revenues** with one children's channel estimated to lose **over 15% of its total revenue** and one music channel estimated to lose **almost 14% of its revenue**. **Twenty four channels** are estimated to lose more than 5% of their revenue.

9.20 As a package that uses nutrient profiling, it is targeted on the regulatory objective of reducing the exposure of children to HFSS advertising and would provide an incentive to promote non-HFSS food and drinks and to innovate, but there may be some operational issues to be addressed in implementing the FSA model.

Option 4

9.21 This package would exclude all advertising and sponsorship of food and drink during pre-school children's programmes. It would also exclude all advertising and sponsorship of food and drink for channels not specifically targeting children during programmes made for children and would include volume restrictions limiting advertising to 30 seconds per clock hour on children's channels (including GMTV on weekends). It would also include the BCAP content restrictions.

Table 9.5: Summary of the Impact of Option 4

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Average revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**30**	**21**	**10.1**	**12.0**	**13.9**	**0.2%**	**12.3%**
PSB	14	10	7.2	8.7	10.1	0.3%	1.7%
DCC	68	67	2.9	3.3	3.7	3.0%	12.3%
Music	0	0	-	-	-	0.0%	0.0%
Other Cab-sat	0	0	-	-	-	0.0%	0.0%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
2	**2.0**	**3.3**	**<11**	**<22**	**<44**	**<53**	**<106**	**<211**

9.22 Table 9.5 above shows that Option 4 would lead to a **30%** or **21%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **3.3** or **2.0** other impacts respectively would be restricted.

9.23 It would have an estimated cost of **£10.1m - £13.9m pa** compared to benefits that are estimated to be close to but less than those for an equivalent HFSS package[47] of **£11m – £44m pa** (QALY) or **£53m – £211m pa** (VoL). Over 70% of this cost would fall on PSBs which would account for about 0.3% of their revenues, the remainder would fall on DCCs. The cost to children's channels would be around **3% of their total revenues** with one children's channel estimated to lose **over 12% of its total revenue**. There would be no estimated cost to music or other cab-sat channels. Two channels are estimated to lose more than 5% of their revenue.

9.24 As a package that does not include nutrient profiling, it would be more straightforward for broadcasters and manufacturers to implement and could readily be extended to cover brand advertising. However there would be less scope for broadcasters to mitigate the resulting revenue loss and manufacturers would have less incentive to reformulate their products or innovate.

9.25 The use of volume restrictions in this package would be complicated to implement and more difficult to monitor and ensure compliance with than for scheduling restrictions. They would also allow some HFSS advertising in programmes made for children and during programmes of particular appeal to children.

Modified Package 1

9.26 This package would exclude all advertising and sponsorship of HFSS foods during programmes made for children and during programmes which are of particular interest to 4-15 year old children. It would also include the BCAP content restrictions.

[47] Since the benefits of a restriction on all food and drink advertising is expected to be close, but lower than a restriction on HFSS advertising – see paragraph 8.33.

Table 9.6: Summary of the Impact of Modified Package 1

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Average revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**51**	**41**	**17.4**	**22.6**	**26.5**	**0.4%**	**15.3%**
PSB	20	17	7.3	10.4	12.4	0.3%	0.7%
DCC	100	100	4.6	5.2	5.9	4.7%	15.3%
Music	41	44	2.1	2.4	2.7	1.9%	8.8%
Other Cab-sat	22	23	3.4	4.6	5.4	0.2%	6.3%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
9	**1.4**	**3.0**	**21**	**42**	**84**	**101**	**203**	**405**

9.27 Table 9.6 above shows that Modified Package 1 would lead to a **51%** or **41%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **3.0** or **1.4** other impacts respectively would be restricted.

9.28 It would have an estimated cost of **£17.4m - £26.5m pa** compared to an estimated benefit of **£21m – £84m pa** (QALY) or **£101m – £405m pa** (VoL). A little less than half of this cost (£7.3m - £12.4m pa) would fall on PSBs which would account for about 0.3% of their revenues. The cost to children's channels would be just under **5% of their total revenues** with one children's channel estimated to lose **over 15% of its total revenue.** The cost to music channels would be about **1.9% of their revenue** with one music channel estimated to lose **almost 9% of its revenue**. Nine channels are estimated to lose more than 5% of their revenue.

9.29 As a package that uses nutrient profiling, it is targeted on the regulatory objective of reducing the exposure of children to HFSS advertising and would provide an incentive to promote non-HFSS food and drinks and to innovate, but there may be some operational issues to be addressed in implementing the FSA model.

Option 5

9.30 This package would exclude all advertising and sponsorship of HFSS foods during programmes made for children and during programmes which are of particular interest to 4-15 year old children and also between 4pm and 6pm. It would also include the BCAP content restrictions.

Table 9.7: Summary of the Impact of Option 5

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Average revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**56**	**46**	**30.1**	**39.5**	**46.1**	**0.6%**	**15.3%**
PSB	28	23	16.8	23.1	27.3	0.8%	1.4%
DCC	100	100	4.6	5.2	5.9	4.7%	15.3%
Music	47	49	2.4	2.7	3.1	2.2%	8.8%
Other Cab-sat	31	32	6.3	8.4	9.9	0.3%	6.3%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
9	**2.5**	**4.9**	**24**	**47**	**94**	**114**	**228**	**457**

9.31 Table 9.7 above shows that Option 5 would lead to a **56%** or **46%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **4.9** or **2.5** other impacts respectively would be restricted.

9.32 It would have an estimated cost of **£30.1m - £46.1m pa** compared to an estimated benefit of **£24m – £94m pa** (QALY) or **£114m – £457m pa** (VoL). Almost 60% of this cost (£16.8m - £27.3m pa) would fall on PSBs which would account for about 0.8% of their revenues. The cost to children's channels would be just under **5% of their total revenues** with one children's channel estimated to lose **over 15% of its total revenue.** The cost to music channels would be about **2.2% of their revenue** with one music channel estimated to lose **almost 9% of its revenue**. Nine channels are estimated to lose more than 5% of their revenue.

9.33 As a package that uses nutrient profiling, it is targeted on the regulatory objective of reducing the exposure of children to HFSS advertising and would provide an incentive to promote non-HFSS food and drinks and to innovate, but there may be some operational issues to be addressed in implementing the FSA model.

Option 6

9.34 This package would exclude all advertising and sponsorship of HFSS foods during programmes made for children and during programmes which are of particular interest to 4-15 year old children and also between 4pm and 8pm. It would also include the BCAP content restrictions.

Table 9.8: Summary of the Impact of Option 6

	Reduction in HFSS Impacts (%)		**Estimated revenue loss** (£million pa)			Average revenue loss as % of total revenue	Highest % loss for a channel in each category
	4 - 9	4 - 15	Low	Central	High		
All Channels	**68**	**60**	**99.5**	**107.2**	**114.9**	**1.8%**	**15.3%**
PSB	49	44	74.6	80.0	85.3	2.6%	2.9%
DCC	100	100	4.6	5.2	5.9	4.7%	15.3%
Music	57	56	2.9	3.4	3.8	2.7%	9.3%
Other Cab-sat	48	47	17.3	18.6	19.9	0.7%	6.3%

Number of channels with >5% revenue loss	**Efficiency**		**Benefits** (£million pa)					
	Other impacts per 4-15 HFSS impact	Other impacts per 4-9 HFSS impact	QALY			VOL		
			Low	Central	High	Low	Central	High
11	**4.0**	**8.0**	**31**	**61**	**122**	**148**	**296**	**592**

9.35 Table 9.8 above shows that Option 6 would lead to a **68%** or **60%** reduction in 4-9 or 4-15 HFSS impacts respectively. For each 4-9 or 4-15 HFSS impact restricted, **8.0** or **4.0** other impacts respectively would be restricted.

9.36 It would have an estimated cost of **£99m - £115m pa** compared to an estimated benefit of **£31m – £122m pa** (QALY) or **£148m – £592m pa** (VoL). Around 75% of this cost (£75 - £85m pa) would fall on PSBs which would account for about 2.6% of their revenues. The cost to children's channels would be just under **5% of their total revenues** with one children's channel estimated to lose **over 15% of its total revenue.** The cost to music channels would be about **2.7% of their revenue** with one music channel estimated to lose **over 9% of its revenue**. Eleven channels are estimated to lose more than 5% of their revenue.

9.37 As a package that uses nutrient profiling, it is targeted on the regulatory objective of reducing the exposure of children to HFSS advertising and would provide an incentive to promote non-HFSS food and drinks and to innovate, but there may be some operational issues to be addressed in implementing the FSA model.

Summary of Impact of Policy Options

9.38 Table 9.9 and Figure 9.1 below summarise the costs, benefits and efficiency of the various policy options.

Table 9.9: Summary of the costs, benefits and efficiency of the policy options

	Reduction in HFSS Impacts (%)		Estimated revenue loss*		Highest % loss for a channel	Channels with >5% revenue loss	Efficiency: other impacts per HFSS impact		Benefits* (£m pa)	
	4 - 9	4 -15	(£m pa)	(%)			4-15	4–9	QALY	VoL
Package 1	49	37	17.6	0.3	15.3	4	1.3	2.6	38	184
Package 2	49	37	24.0	0.4	18.5	6	1.7	3.1	<38	<184
Package 3	44	36	72.7	1.2	12.3	6	5.0	9.2	<37	<179
Pre-9pm Ban	89	82	210.5	3.5	15.3	24	5.5	11.4	84	406
Option 4	30	21	12.0	0.2	12.3	2	2.0	3.3	<22	<106
Modified Package 1	51	41	22.6	0.4	15.3	9	1.4	3.0	42	203
Option 5	56	46	39.5	0.6	15.3	9	2.5	4.9	47	228
Option 6	68	60	107.2	1.8	15.3	11	4.0	8.0	61	296

Note: This excludes the impact on channels licensed in the UK broadcasting to overseas markets (see paragraphs 3.28-3.32)
* This table shows the central estimates of the costs and benefits – low and high estimates are shown in the discussion of individual policy options above.

Figure 9.1: How the costs and benefits increase with the reduction in impacts

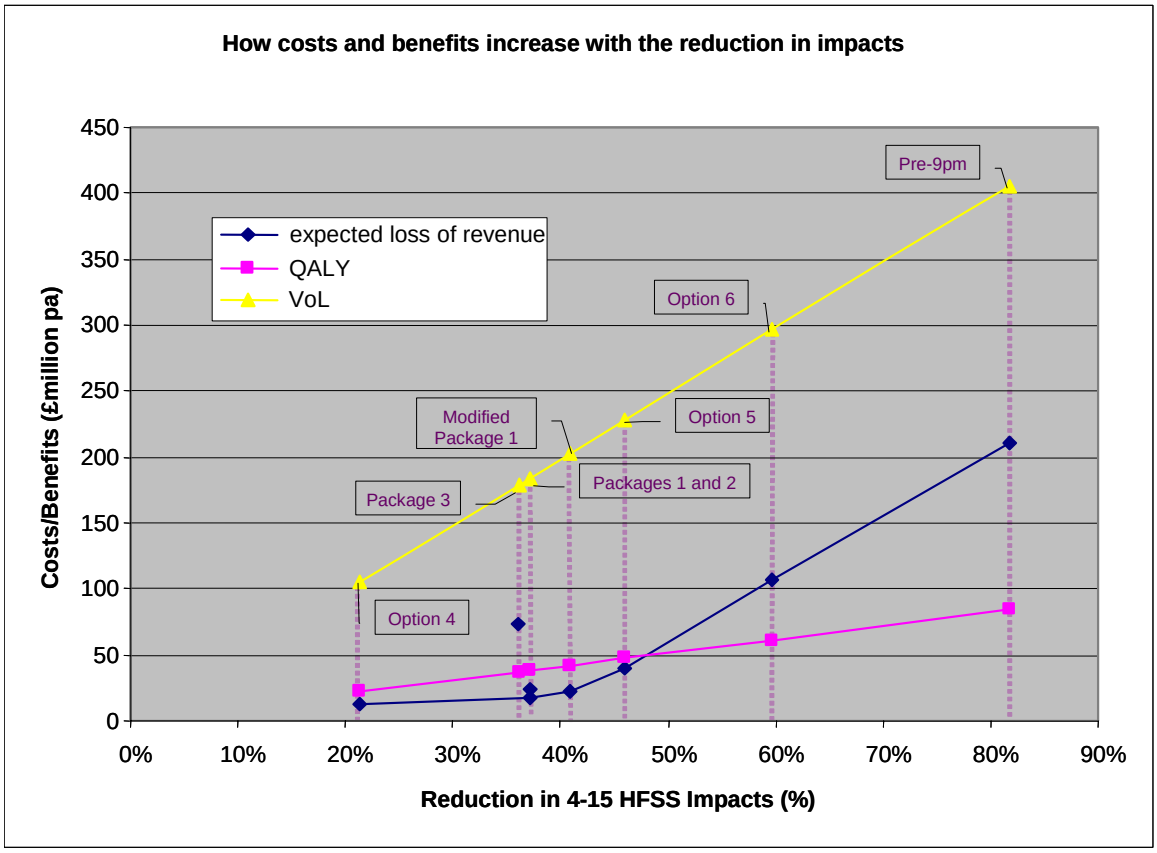
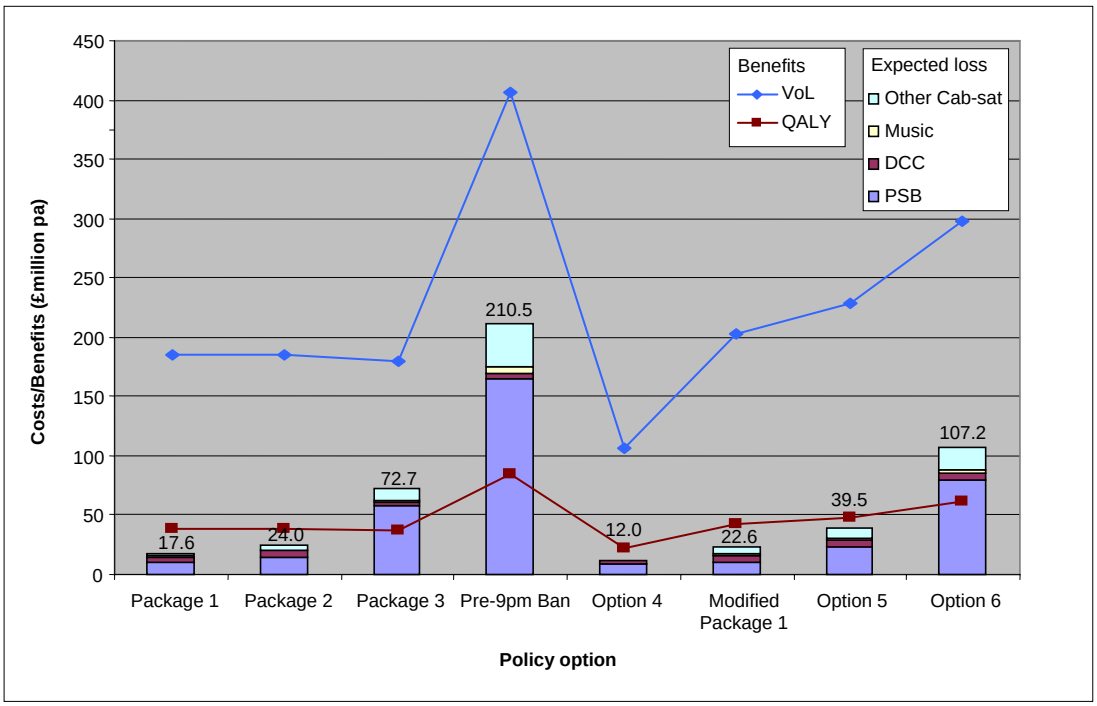


Figure 9.2: Summary of the costs and benefits of the policy options



9.39 Table 9.9 and Figures 9.1 and 9.2 show that:

- The **most efficient (or targeted) options** are Packages 1 and 2, Modified Package 1 and Option 5 (since they restrict the smallest number of adult or non-HFSS child impacts for each HFSS child impact restricted), while the **least efficient options** are the pre-9pm ban, Package 3 and Option 6;
- As the restrictions become tighter, the **costs increase faster than the benefits** based on QALYs**,** and at a similar rate to benefits based on VoL;
- For all options, the **benefits based on VoL exceed the estimated costs** to broadcasters;
- However Package 3, the pre-9pm ban and Option 6 all have **estimated costs which are higher than the benefits based on QALYs**; and
- Even for Packages 1 and 2, Modified Package 1 and Options 4 and 5 - where the benefits based on QALYs exceed the estimated costs - **the lower end of the benefits range is lower than the central estimate of the costs** (apart from Package 1, where it is still lower than the upper end of the cost range).
- In **absolute terms** the costs of all the policy options fall heaviest on the PSBs, but in **proportionate terms** the children's channel are most affected;
- Modified Package 1 and Options 5 and 6 have a **significant impact on music channels**, which is not the case for Packages 1, 2 or 3;

IA Annex A

FSA Research

ESTIMATION OF THE MONETISED HEALTH BENEFITS THAT WILL ACCRUE TO THE UK GIVEN POLICY DESIGNED TO RESTRICT BROADCAST PROMOTION OF CORE CATEGORY FOODS TO CHILDREN

Executive Summary

The following analysis seeks to estimate the monetised health benefits that will accrue to the UK given policy designed to restrict the broadcast promotion of core category foods aimed at the nation's children. There are many dietary related conditions that can affect children both directly (including irreversibly e.g. Type 2 diabetes) and/or their health status as adults (e.g. risk of stroke). We commence this analysis by considering the benefits of such policy in terms of reduced obesity in the UK and then widen our analysis, from calorie intake alone, to capture the much larger dietary related health benefits at stake through the consumption of all nutrient groups.

Within our obesity cost analysis we develop a chain linking: the television advertising children are exposed to; the current eating habits of British children; a model of substitution away from core category foods towards realistic healthier options as advertising is restricted; the effects of these substitutions on energy intake; the effects of energy intake on weight (and Body Mass Index); and given the current distribution of BMI (via which obesity is measured), the effects these changes in BMI would have on childhood obesity.

We then map childhood to adulthood obesity and seek to monetise the health and other associated benefits of reduced obesity via the existing costs of obesity work conducted by The National Audit Office and the House of Common's Health Committee.

In the next section of the analysis we seek to monetise the wider dietary related health benefits that this policy will provide. We again interrogate our modelled substitute child nutrient intake results, especially those relating to salt, saturated fat, sugar and fruit. We discuss the potential for these substitutions in children's diets to be extrapolated into adulthood.

Given this we use the Department of Health's White Paper and current analysis to estimate reductions in mortality and morbidity via reduced daily intakes of some nutrients and

increases in others. Thus we estimate the annual amounts of UK lives and suffering predicted to be saved by such nutrient intake substitutions.

To estimate the economic value of these health benefits we employ statistical value of life (using willingness-to-pay methodologies) and quality adjusted life year figures. Having monetised these benefits we discount them appropriately to obtain annual present value estimates. Our base case result estimates this policy to yield between £125 million and £600 million's worth of annual health benefits via avoided mortality and morbidity in the UK, given a complete ban of such broadcast promotion to children.

We finally consider whether there is sufficient uncertainty relating to children's dietary related health outcomes to also employ the precautionary principle in the current policy formation considerations.

Contents

The Direct and Indirect Effects of Broadcast Food Promotion on Children's Preferences and Consumption

Direct Effects

Two UK publicly funded studies have been commissioned into understanding and reviewing the body of research into the effects of food promotion to children. The first being on behalf of the FSA conducted by Professor Hastings et al.[48] The second being that of Professor Livingstone[49] on behalf of OFCOM. Hastings et al. consider that there is sufficient evidence to conclude that food promotion is having an effect, particularly on children's preferences, purchase behaviour and consumption.

Similarly, Livingstone's report concludes that there does indeed exist a consensus amongst the many studies she considers in favour of modest direct effects of TV advertising on children's food preferences, knowledge and behaviour. However, Livingstone seldom finds robust quantification of the direct effects of TV advertising. This said, two of the studies considered by Livingstone are illustrative.

Firstly, Susan Hearold's[50,51] (1986) large-scale meta-analysis study considered the effects of television viewing on antisocial and prosocial behaviour by children. As noted in Livingstone's report, Hearold found fairly consistent, but fairly modest direct effects with television violence accounting for around 5% of the variance in the dependent variable. The extent to which this quantification of the direct effects of exposure to violent images can be applied to food promotion is a moot point.

Secondly, Ruth Bolton's[52] (1983) US study actually sought to model the consumption patterns of children as they were exposed to broadcast food promotion. Whilst only finding that the impact of television food advertising explained 2% of the variance in children's snacking frequency, Bolton's study did directly link TV advertising of food to consumption (as opposed to preference).

It is interesting to note that Bolton's effect relating to increases in snacking frequency (child's number of snacks per week) and caloric intake via commercial exposure (average food commercials viewed by the child in minutes per week) involves marginal viewing analysis. Where as she did illustrate the likely amount of broadcast promotion that would yield a snacking event, it is possible that the more restrictive any potential policy is in

[48] Hastings, G., Stead, M., McDermott, L., Forsyth, A., MacKintosh, A., Rayner, M., Godfrey, C., Caraher, M., and Angus, K. (September 2003). Review of research on the effects of food promotion to children.

[49] Sonia Livingstone. (2004). A commentary on the research evidence regarding the effects of food promotion on children - Appendix 1.

[50] Hearold, S. (1986). A Synthesis of 1043 Effects of Television on Social Behaviour. In G. Comstock (Ed.). Public Communications and Behaviour: Volume 1 (Vol. 1, pp. 65-133). New York: Academic Press.

[51] Hearold's study considered the behaviour of children following exposure to a variety of "antisocial" eg violent, and "prosocial", eg *Lassie*, viewing. It considered the effects on children of an average age of 13 years (11.5 years median) across 230 studies (mainly from the US) over a fifty-year period.

[52] Bolton, R. N., (1983). Modeling the Impact of Television Food Advertising on Children's Diets. Current Issues and Research in Advertising 1983.

reducing/eliminating broadcast promotion to children so its effectiveness may disproportionately increase. The effectiveness of reducing exposure at the margin to children experienced in viewing a certain level of broadcast promotion of core category foods may be less effective than removing this broadcast promotion entirely, thus removing its total effect directly on children. That said, and as explained later, in our modelling of child dietary outcomes we will take a conservative approach to the potential improvements available, as broadcast advertising of core category foods is restricted.

Commenting on the US Institute of Medicine's Food Marketing to Children and Youth: Treat or Opportunity report[53], MacLeod and Levine[54] note that two of the five conclusions the report reached (based on the meta-analysis of previous studies) were that: "Along with many other intersecting factors, food and beverage marketing influences the diets and health prospects of children and youth, and that; Food and beverage marketing practices geared to children and youth are out of balance with healthful diets, and contribute to an environment that puts their health at risk."

In their study, When Children Eat What They Watch: Impact of Television Viewing on Dietary Intake in Youth (2006), Wiecha et al[55] consider five US schools (548 children) near Boston. They find that each hour increase in television viewing was associated with an additional 167 kcal per day intake with this association "mediated by increasing consumption of calorie-dense low-nutrient foods frequently advertised on television."

Another recent US study by Grossman et al.[56] of the potential effects of a complete fast food restaurant advertising ban on television is presented in Annex 1. The authors find potentially very significant effects on childhood obesity of such a ban, although their methodology differs from the one presented below where we seek to explain changes in children's Body Mass Indexes as their calorie intakes vary as a result of broadcast promotion restrictions.

In contrast another recent paper by Zywicki et al.57 considers that the available US evidence does not support the idea that food advertising to children has grown significantly during the period that their obesity levels have dramatically risen. Indeed they believe that restricting truthful food advertising may have negative welfare consequences as increasing consumer awareness of the importance of weight control may lead to competition in healthy advertising.

Complementary Indirect Effects Which Act to Bolster Broadcast Promotion's Influence on Children's Nutrient Intakes and the Policy Effect Base Case

[53] Institute of Medicine (2006). Food Marketing to Children and Youth: Threat or Opportunity. Washington, DC: National Academies Press.
[54] MacLeod, William C., Levine, Jason K. Inconclusive Evidence: The Institute of Medicine Report on Food Marketing to Children. Consumer Protection Update, Volume 13, No.1, Spring 2006.
[55]Wiecha, J.L., Peterson, K.E., Ludwig, D.S., Kim, J., Sobol, A., Gortmaker, S.L. When Children Eat What They Watch: Impact of Television Viewing on Dietary Intake in Youth. Arch Pediatr Adolesc Med. 2006;160: P436-442.
[56] Shin-Yi Chou, Inas Rashad, Michael Grossman (December 2005). Fast Food Restaurant Advertising on Television and Its Influence on Childhood Obesity. NBER Working Paper No. 11879.
[57] Zywicki, T.J., Holt, D.' Ohlhausen, M. Obesity and Advertising Policy. Working Paper Series, Paper 3 George Mason University School of Law (2004).

Livingstone notes that, "It has also been suggested that food promotion may have greater indirect than direct effects. However, this cannot be demonstrated easily, if at all, using the experimental designs required for causal claims" [58].

As OFCOM's surveys found, peer pressure is a notable influence on the food choice of children. To the extent that broadcast promotion influences children to consider core category foods to be desirable within this cohort environment, there are likely to be significant feed-back effects of this advertising through peer pressure, cultural expectations, habits etc. into children's food choices.

Given this it is proposed that when considering the total effect of broadcast food promotion to children, FSA/OFCOM will acknowledge both these direct and indirect nutrient consumption effects.

As is now explained, (especially given the effects of broadcast promotion on child consumption found by Bolton (1983)), as well as reporting a modelled 5% policy success effect, we consider a 10% policy effect to be achievable and a realistic, if conservative, base case to be considered during this analysis. For information, we also report complete success (100%) regarding child take-up of our modelled changes (substitutions) in nutrient consumption.

The base case is aimed at illustrating an average 10% dietary substitution across the child population. In other words, 10% of the modelled food substitutions[59] undertaken by the FSA (a 10% policy success effect) are achieved in the base case for each child. As these children move into adulthood so further consideration of the maintenance of these substitutions is then required[60].

To explain why we chose and consider that this 10% base case policy success is realistic and conservative, if we do assume a linear effect of broadcast exposure on child snacking in Bolton's work she would show an average of three less weekly snacking events per child given a total broadcast advertising restriction[61]. As noted in the dietary modelling to follow, we do not model the removal of any child eating episode, instead we suggest substituting more nutritious foods for core category ones[62]. At the 10% base case we are in essence modelling only two of the child's weekly main meals (assuming three meals per day) as being substituted for relatively more nutritious ones given a total broadcast advertising

[58] Sonia Livingstone. (2004). A commentary on the research evidence regarding the effects of food promotion on children - Appendix 1 (P28).
[59] Explained in detail later.
[60] This too is explained in detail later.
[61] Bolton (1983), p193-4.
[62] Bolton states, p194, that: "Third, children's exposure to television food advertising significantly decreases their nutrient efficiency, in addition to the indirect effect it has through increases in snacking frequency. …this implies that the child is substituting low-nutrient, high-calorie foods for previously consumed foods with equivalent calories but higher levels of nutrients. This is consistent with the notion that children's snack or meal food preferences are being influenced by the predominance of low-nutrient, high-calorie foods advertised on television."
With this Bolton is saying that not only is the nutrient value of what children eat on average being reduced by increased snacking, but television food advertising is also acting to make children's diets less nutritious as they substitute towards low-nutrient foods even when not snacking.
This message from Bolton lends support to the FSA/OFCOM's approach to modelling dietary substitutions as core category broadcast food advertising is restricted.

restriction. Again we explain that we consider even these meal substitutions to be sensible and not unrealistically healthy.

Indeed, in terms of calories consumed by a child, from Bolton's results[63] a weekly increase (decrease) of 1.81% occurs as they are exposed to a third increase (reduction) in TV food advertising. This figure is derived from both the effect of increased (decreased) advertising on the composition of existing eating events[64] and additional (reduced) snacking[65]. By contrast the FSA's base case of a 10% policy effect only constitutes a modelled 1.17% reduction in calorie intake for boys aged 11-15 and 1.26% for girls of that age (see Annex 5) assuming a complete restriction of core category TV impacts to children, not just a reduction by a third.

Thus, FSA/OFCOM considers that the choice of a 10% base case policy effect is consistent with a conservative interpretation of Bolton's work.

Given the importance manufacturers and retailers of core category food products place on broadcast promotion e.g. see Section 3 of the main consultation document, a further possible indirect effect of broadcast restrictions comes with the potential that some manufacturers may seek to reformulate some of their products such that they can continue to be advertised on television to children. This possible indirect outcome of the policy could feed positively into the diets of many adults as well as children.

As a further potential complementary effect, the Government is considering taking action to restrict advertising of core category foods to children via other forms of advertising such as billboards[66]. To the extent that these media complement, or may act as substitutes to each other in advertising campaigns to children, this wider consideration of advertising restrictions is likely to bolster the effectiveness of each restrictive policy strand[67].

[63] Table 3, p188.
[64] This is reported as a coefficient of 0.0186, relating to minutes of food commercial exposure and percentage caloric intake (this coefficient is not found to be statistically significant).
[65] This effect's magnitude involves gleaning the product of two reportedly significant coefficients, 0.0388 and 1.3862; thus yielding 0.0538, again relating to minutes of food commercial exposure and percentage caloric intake.
[66] Department of Health. 2004. Choosing health: making healthy choices easier.
[67] As noted by Hastings, G., et al. (September 2003), P3.

International Experience Concerning Restricting Broadcast Promotion to Children

Two of the most long-standing international broadcast promotion to children interventions are those of Quebec in Canada and Sweden.

Quebec's Consumer Protection Act means that since 1980 commercial electronic or printed media advertising directed to children under the age of 13 has been banned.

When considering its impact on breakfast cereals and children's toys, Goldberg (1990) considered that this Quebec law did appear to be influencing children's sweetened breakfast cereal consumption[68]. He reached the conclusion that: "The Quebec law served to reduce children's exposure to commercials for sugared cereals and hence appears to have reduced consumption of those cereals. There is no reason to believe that comparable legislation in the US would not have comparable results."

In terms of the evidence relating to the prevalence of childhood overweight in Canada, the comparison across Provinces provided by Willms et al.[69], whilst not being significant at the 5% level does report that between 1981 and 1991, the rate of increase of overweight in Quebec was lower than the Canadian average. An odds ratio of 0.88 is reported such that it is approximately 10% lower than the average rate of increase. However, this is not to suggest that any direct influence from the Quebec advertising law had been considered. That said, Ashton[70] considers the Willms et al. study to show that in Quebec: "although food advertising to children has been banned since 1980, childhood obesity rates are no different from those in other Canadian provinces."

In Sweden, all television and radio advertising aimed at children ages 12 and younger during children's programming was banned in 1991. Again, Ashton (2004) comments that: "A similar advertising ban has existed in Sweden for over a decade, but again this has not translated into reduced obesity rates." However, this view seems based on the one salient statistic available from Lobstein and Frelut's[71] (2003) study, that in 2000-01 the percentage of overweight 9-11 year old Swedes was 18%. Whilst this figure is not markedly different from those presented for other countries in Lobstein and Frelut, we note that a one-off country measure like this does not allow for fuller consideration of history or other environmental factors that may be at play.

[68] Goldberg, M.E. A quasi-experiment assessing the effectiveness of TV advertising directed to children. Journal of Marketing Research. 1990; XXVII, p445-54.
[69] Willms, J.D., Tremblay, M.S., Katzmarzyk, P.T. Geographic and Demographic Variation in the Prevalence of Overweight Canadian Children. Obesity Research, Vol. 11, No. 5. May 2003.
[70] Ashton, D. Food Advertising and Childhood Obesity. Journal of the Royal Society of Medicine 2004, Vol 97. No. 2. P51-2.

[71] Lobstein, T., Frelut, M.-L. Prevalence of overweight among children in Europe. The International Association for the Study of Obesity. Obesity Reviews 4, 2003. P 195-200.

The Nutrient Intake of UK Children: Modelling the Potential Effects of Broadcasting Restrictions

Using the National Diet and Nutrition Survey (NDNS) of Young People aged 4-15 years (1997[72]); we have obtained data demonstrating the eating habits of British children. This includes the types of foods and the quantities consumed. By examining the consumption patterns of, separately, boys and girls, we have been able to obtain their mean intakes of: energy; saturated fat (as a percentage of food energy); non-milk extrinsic sugars (NMES, as a percentage of food energy); protein; NSP fibre; sodium (and thus salt); iron; fruit; calcium; vitamin C and folate.

Our analysis of these children's diets has been grouped within the age ranges 4-6, 7-10 and 11-15 years. This grouping has been necessary to allow the sample sizes of boys and girls from the NDNS to be large enough to be statistically robust within this analysis.

Using the FSA's Nutrient Profiling Model[7374], FSA Nutritionists have modelled healthier choices that can realistically be substituted for existing high fat salt and sugar (HFSS) foods within these NDNS children's diets. These substitutions are presented in Annex 2 and cover five of the "Big Six" core category foods with which this benefit estimation analysis is concerned. Due to difficulties of modelling them within the parameters of the NDNS, pre-prepared convenience foods are not provided with potential healthier substitutes.[75]

Given that certain categories of food, such as chocolate confectionery, can be consumed as both snacks and as part of a wider meal, our NDNS substitution modelling away from core category foods towards healthier options does not consider the removal of any food intake incident. I.E. we do not curtail the snaking frequency of children; we simply model replacing a core category snack (or any other incidence of core category consumption within a meal) with a healthier option[76].

Indeed, it is to be expected that children will snack and although, as noted, restricting broadcast promotion is likely to reduce this frequency (see Bolton, 1983) we here model substituting core category snacks for fruit[77].

---

[72] The 1997 NDNS is the most up-to-date survey of British children's nutrient consumption patterns of sufficient detail to undertake the analysis required here.

[73] Which is based upon the energy, saturated fat, total sugar, sodium, protein, NSP fibre, fruit and vegetable content of each food item.

[74] FSA's Nutrient Profiling Model – now passed to OFCOM; www.food.gov.uk/healthiereating/nutlab/nutprofmod).

[75] As such the nutritionally-based health and economic benefits that are presented in this analysis are likely to be conservative for a given broadcast food promotion restriction policy.

[76] It would be difficult in practice to identify all snacking frequency within the NDNS as the snack food category is also consumed along with main meals.

[77] Horne et al. (Horne, P.J., Tapper, K., Lowe, C.F., Hardman, C.A., Jackson, M.C. and Woolner, J. Increasing children's fruit and vegetable consumption: a peer-modelling and rewards-based intervention. European Journal of Clinical Nutrition (2004) 58, P1649-1660.) have conducted a London school intervention study that consisted of both peer modelling and rewards aimed at increasing consumption of fruit and vegetables. The peer modelling was via videos that featured hero figures who enjoy eating fruit and vegetables together with popstars and television presenters supporting the healthy eating message. The rewards included pencils and stickers for children who ate target amounts of fruit and vegetables.
Compared with the baseline fruit and vegetable intakes the intervention period saw very large increases in consumption. Even after these declined somewhat, at the end of a four-month

As can be seen from Annex 2's tables of core category products modelled to be substituted, the FSA has tried to make the substitute foods both realistic and nutritious (and consistent with the foods that are allowable for continued broadcast promotion without restriction within the Nutrient Profiling Model). Thus illustrating the potential benefits of a more healthy diet for British children.

We examine, by nutrient group, the effects of moving from the outturn children's diet of 1997 to a more healthy diet. These dietary benefits will then be mapped onto potential health and economic benefits over the children's lifetime.

Mapping Children's Nutrient Intakes to Health Outcomes - Obesity (Measurement)

Obesity can be measured in several different ways. Due to its ease of application and its relationship to health risk factors the Body Mass Index (BMI) has become the internationally recognisable measure of obesity and overweight. Obesity has been defined as BMI greater than 30 Kg/m^2 and overweight as over 25 Kg/m^2. A full discussion of the measurement of obesity and overweight is included in Annex (Obesity Measurement). The classification system used for adults is not appropriate for children because the development of children's body mass development is not linear throughout a child's development. The classification system that we use in England (and in this work) is based on the 85^{th} and 95^{th} percentiles of the 1990 Health Survey for England. Fuller discussion and a listing of the cut-off points are included in Annex 3 along with an overview of the current size of the childhood obesity problem facing the country.

We have now laid out how it is possible to conduct scenario analysis as to the effectiveness of various forms of broadcast promotion restrictions to children regarding core category foods and how these may translate in terms of food choice substitutions and thus nutrient intakes (by age and sex). As we now also have a means of measuring childhood obesity and its distribution by age and sex, the next step in our analysis is to understand the relationship between nutrient intake and health outcomes; (at this stage) especially obesity.

---

maintenance phase fruit consumption was 69% higher than its baseline in the experiment school and vegetable intake was 34% higher. In the control school the consumption of both had fallen below the baseline.

Horne et al. comment that: "The present study suggests that television can be used to positively influence children's diets." Whilst appreciating that this study concerned positive messages for fruit and vegetable consumption as opposed to restriction of core category food adverts and that the videos shown were of greater length than traditional television adverts (six minutes), the FSA notes the considerable uplifts in (especially fruit) intake that were achieved from baseline.

Calorie Intake – Child Weight/Body Mass Index Dose Response Function

Following recent analysis by the Standards and Quality Analytical Team (economics) of the Department of Health, a method for linking changes in child body weight to changes in energy balance (here we are concerned with calorie intake) has been developed. The derivation of this methodology is attached at Annex 4. The effect of a one-calorie per day change in energy intake is inversely proportional to the increase in basal metabolic rate (BMR) per unit weight and the level of physical activity (PAL). Reference values for BMR and PAL have been taken from an international study. [78]

As an illustration of the effect of a change in the energy balance suggested by this dose response function; a 100-calorie reduction in intake would lead to an approximate 10% reduction in body weight in boys and girls in primary school. It is interesting to note that Cutler et al.[79] find that a "strikingly small" average daily increase in net energy intake of 150 calories would be enough to explain the rise in obesity prevalence in the United States in the closing two decades of the twentieth century. Although they do not conclude on causality.

[78] ftp://ftp.fao.org/docrep/fao/007/y5686e/y5686e00.pdf

[79] Cutler DM, Glaeser EL, Shapiro JM. Why have Americans become more obese? J Econ Perspectives 2003;17:93-118.

NDNS Child Nutrient Intake Modelling Results - Obesity

As explained above, the outturns of the 1997 NDNS nutrient intakes for British children were modelled to substitute core category foods by realistic healthier choices and in accordance with the FSA's Nutrient Profiling Model. This was conducted for five groups of children (11-15 boys and girls separately, 7-10 boys and girls separately and 4-6 boys and girls combined) the levels of aggregation chosen to allow the sample sizes to be statistically robust within this analysis.

Breakdowns were obtained by nutrient group for uplifted[80] 1997 intakes and were compared to the nutrient intakes that would have occurred should there have been some substitution to healthier options from core category foods. This enabled us to estimate the potential nutrient intake effects of restricting the promotion of core category foods to children via broadcasting.

Focusing on calories and the subsequent impact on BMI levels and obesity prevalence, we can see the potential impact of the policy. Detailed results are shown in Annex 5. Focusing on 11-15 years olds, BMI levels reduced by 4.41 Kg/m^2 and 3.52 Kg/m^2 for girls and boys respectively, under a 100% successful policy. When these impacts are translated into obesity prevalence, the change is substantial, as shown below.

Age/Sex	Implied Reduction in 2003 HSE Child Obesity Via The Obtained BMI Reductions By Policy Success[81]		
	5%	**10%**	**100%**
Average Boys age 11 -15	3%	6%	60%
Average Girls age 11-15	4%	8%	76%

[80] Following, the analysis of Rennie et al. (Rennie, K.L., Jebb, S.A, Wright, A., Coward, W.A. 2005 Secular Trends in Under-Reporting in Young People. British Journal of Nutrition, 93) the reported NDNS energy intakes were uplifted within our analysis to compensate for under-reporting within the survey. For 11-15 year olds an uplift of 25% was employed; for 7-10 year olds, 20% was used and for 4-6 year olds, 15% was used. In a similar way an uplift of 15% for salt intake was applied across each age group.

[81] Figures generated by scaling reductions linearly by percentage from 100% successful policy modelling. See Annex 5 (Changes in Obesity).

Not all of the obese adolescents considered in our analysis would have become obese adults (in the absence of this potential policy). Thus when monetising the costs to the economy of adult obesity in this policy context we propose to apply a 70% obese adolescent to obese adult conversion ratio[8283]. As such, the average policy-led reductions in 2003 HSE childhood obesity obtained above would, for 100% policy effectiveness, yield **42%** of obese boys and **53%** of obese girls from not becoming obese adults[84].

As a result of changes in BMI some people will be reclassified within the adiposity framework we are using. We found that for each child age/sex and policy success scenario the number of children reclassified from obese to overweight was less (and in many cases considerably less) than the number that had been reclassified from overweight to healthy. As such we consider it conservative within this analysis to simply concentrate on the potential health and economic benefits of reduced childhood obesity that may accrue from this potential policy.

What Ratio of Obese Adults Were Overweight as Children?

It is to be noted that the available UK evidence relating to the proportion of obese adults who were obese as children is not high. Indeed, Power et al.[85] comment that, "In general the majority of obese adults were not fat in adolescence". Their own UK analysis shows approximately 11-13% of obese adults having been obese children.

Despite these existing historic studies, the general trend of obesity expanding in British children of all ages appears to be increasing the scope for obesity in childhood to map into adulthood. We should note that as the "obesogenic environment" is relevant to the whole UK population. It is increasingly possible that the seeds of longer term obese-creating diets are developing in childhood but do not manifest as obesity until adulthood. This said, given Power et al.'s study, it is considered that taking a 12% figure of obese adults having been obese children is appropriate[86]. Thus, the implied direct reduction in adult obesity given a 100% successful policy would eventually approximate 6%[87]. A 10% effective policy would reduce obesity by 0.6%.

[82] The Parliamentary Office of Science and Technology consider that overweight adolescents have a 70% chance of becoming overweight or obese adults in Britain. September 2003, Postnote Number 205.

[83] Indeed, in their DoH co-funded review, Power, Lake, and Cole (1997)'s own UK analysis showed that between the ages of 11 and 33, 59% of obese children were still obese in adulthood. Between the ages of 16 and 33, this figure rose to 71%.

[84] For simplicity, assuming that the obese adolescents who would anyway not become obese adults are uniformly distributed amongst obese adolescents.

[85] Power, C., Lake, J.K., Cole, T.J. Measurement and long-term health risks of child and adolescent fatness. International Journal of Obesity (1997).

[86] See later in this section for further contemporary evidence tracking more general childhood diets longitudinally.

[87] This estimate concentrates solely on obesity manifesting in under-16s. It is thus a very conservative estimate as the policy will also affect the diets of some of those who would otherwise manifest as obese in adulthood.

The Health and Economic Costs of Adult Obesity

It is considered that the most comprehensive estimates of the cost of obesity produced in Britain to date have been those of The National Audit Office in 2000 and the House of Common's Health Committee[88] in 2002.

The NAO calculated the costs of obesity at 1.5% of NHS expenditure. For the population of England in 1998, they also estimated the economic costs of obesity to be around £480 million in direct costs and £2.1 billion in indirect costs, with a projected total of £3.6 billion (per annum) by 2010.

In 2002, the House of Common's Health Committee updated this estimate to £3.3-£3.7 billion for 2002 (comprising of direct NHS costs of £990-£1,225 million, lost output due to premature mortality of £1.05-£1.15 billion and lost output due to sickness absence of £1.3-£1.45 billion). This higher cost reflects: the prescription of new, more expensive drugs to obese individuals; more accurate data, increasing levels of obesity and the inclusion of more co-morbidities. For example, whilst the NAO's study considered the costs of obesity-attributed hypertension, Type 2 diabetes, some cancers etc., the HoCHC also included psychological problems and lower back pain. However, as noted in the Report (p129) this estimate should still be seen as an underestimate, given that it does not, for example, capture all of the relevant NHS costs. In addition, individuals' own willingness-to-pay to avoid the mortality and health risks that come with the condition of obesity are not captured[89].

Uplifting this conservative annual estimate of the cost of obesity in England to the UK population level, and adjusting for relative prevalence, yields an annual cost of £4.0–4.5 billion[90]. If we take the mid-point as our assumed UK cost of obesity (£4.25 billion per annum in 2002 prices), and taking a historical 12% figure of obese adults having been obese children, we identify a conservative economic cost of just over £500 million that this policy potential influences. This is a conservative approach in that many children are likely to have developed dietary habits that are conducive with obesity in later life that does not actually manifest in childhood.

Given 100% "policy effectiveness" yields 42% of obese boys and 53% of obese girls from not becoming obese adults – 47.5% average. Then, 100% policy effectiveness would reduce adult obesity by 5.7%, saving £242 million per annum (2002 prices). At 10% policy effectiveness this equates to £24 million per annum (2002 prices).

There are many health effects of childhood obesity. These include increased blood lipids, glucose intolerance, hypertension and increases in liver enzymes associated with fatty liver[91].

[88] House of Commons Health Committee. Obesity. Third Report of Session 2003-04. Tackling Obesity in England: HC 220 Session 2000-2001: 15 February 2001.

[89] The own willingness-to-pay to lessen/avoid health risks is considered in more detail regarding dietary health more generally later.

[90] Estimate for Wales's base only on population as no accurate obesity prevalence data available. Estimates for Scotland and Northern Ireland calculated using population figures from ONS Population trends 120 (2005), and prevalence data from the Scottish Health Survey (1998) and Northern Ireland Health and Social Wellbeing Survey (1997).

[91] Parsons, T.J., Power, C., Logan, S., Summerbell, C.D. Childhood Predictors of Adult Obesity: a Systematic Review. International Journal of Obesity (1999) 23, Suppl 8, S1-S107.

Indeed, adult blood pressure[92], arthritis[93], cardiovascular disease[94] and menstrual problems[95] can all be driven by childhood obesity independent of adult weight. But realistically the bulk of these obesity costs would occur in (later) adulthood. Given this significant discounting of these annual benefit figures would be required to provide a present value of the policy benefits. As the benefits from avoided obesity are only part of the wider dietary related benefits of this policy we conduct this discounting exercise in the next section when more of the policy's benefits have been estimated.

[92] Lauer RM, Clarke WR. Childhood risk factors for high adult blood pressure: the Muscatine study. Pediatrics (1989) 84, 633–641

[93] Must A, Jacques PF, Dallal GE, et al. Long-term morbidity and mortality of overweight adolescents; a follow-up of the Harvard Growth Study of 1922 to 1935. New England Journal of Medicine (1992) 327, 1350–1355

[94] *ibid.*

[95] Lake JK, Power C, Cole TJ. Women's reproductive health: the role of body mass index in early and adult life. International Journal of Obesity (1997) 21(6), 432-439.

NDNS Child Nutrient Intake Modelling Results – All Nutrients

When we considered the NAO's and the HoCHC's estimations of the costs of obesity to England we explained that these included the impacts of other health conditions, a proportion of which were attributed to the obesity condition. This is, however, only part of the diet related health story. For example, whilst the event of a stroke can have its probability increased if a person is obese, a potentially greater dietary contributory factor to stroke is over-consumption of salt (not calories). Given this, it is necessary to consider the potential dietary health benefits of restricting the broadcast promotion of core category foods to children across the range of nutrient intakes (calories and thus reduced obesity benefits will be nested within these) and then capture the full economic value of these benefits.

Do Good/Bad Diets Persist From Formation?

In terms of the wider nutrient categories, longitudinal analysis linking childhood with associated levels of adult consumption are not currently systematically available in the UK. However, the literature does support an understanding that it is more difficult to change the preferences and consumption habits of adults than children who are still forming these. Thus providing a further rationale for acting to alter the consumption patterns of children[96]. Indeed, as noted by Parsons et al. when reviewing childhood predictors of adult obesity: "In addition to the observed tracking of adiposity from childhood to adulthood, it has been suggested that lifestyle habits such as diet and activity levels may also track during childhood and into adulthood. There is some evidence that such tracking occurs,".[97]

More specifically, when analysing the mineral and vitamin intakes of pre-school children from Edinburgh, Payne and Belton's[98] findings lead them to consider that, "This suggests that early establishment of a good quality diet is extremely important as low levels of nutrient intake tend to persist".

This message has been recently reinforced by the contemporary work of Pauline Emmett and team at the University of Bristol. The Avon Longitudinal Study of Parents and Children[99] (ALSPAC, the "Children of the 90s" study) is ongoing and in research presented to the World Cancer Research Fund Forum (Bristol 2004), Dr Emmett discussed findings that the mean weight of fruit and vegetable intake consumed per MJ of energy actually fell between the child cohort's ages of 3 and 7 years from 28.9g/MJ to 27.2g/MJ. Not only did this tracking figure fall, but the ALSPAC researchers consider that a figure of 45g/MJ would be consistent with WHO intake recommendations after the age of 5 years[100]. As such the implication is that having possessed a relatively low level of fruit and vegetable intake at pre-school age, this

[96] In addition, potential indirect effects of core category food broadcast promotion restrictions to children such as voluntary product reformulation to allow continued television advertising to children are once more relevant and valid.
[97] Parsons, T.J., Power, C., Logan, S., Summerbell, C.D. Childhood Predictors of Adult Obesity: a Systematic Review. International Journal of Obesity (1999) 23, Suppl 8, S1-S107.
[98] Payne, J.A., Belton, N.R. Nutrient intake and growth in pre-school children. II. Intake of minerals and vitamins. Journal of Human Nutrition and Dietetics (1992), 5, 299-304. P304.
[99] www.alspac.bris.ac.uk
[100] Glynn, L., Emmett, P., Rogers, I., ALSPAC Study Team. Food and nutrient intakes of a population sample of 7-year-old children in the south-west of England in 1999/2000 – what difference does gender make? Journal of Human Nutrition and Dietetics (2005), 18, 7-19. P10.

current cohort of children in the Bristol area saw this intake track to a worse level by age 7 years at amounts considerably below those recommended by the WHO.

Nutrient Intakes and Preventable Mortality and Morbidity

Salt is a significant risk factor in developing high blood pressure and cardiovascular disease (the main components of which are coronary heart disease and stroke). In addition, a high intake of saturated fat is associated with raised levels of blood cholesterol, a major risk factor for coronary heart disease[101].

The recommended daily amounts of salt consumption vary by age group for children. However, the NDNS 1997 found that for each of the three age groups studied children on average significantly overshot these amounts. 11-15 year olds have a target of 6g, their outturn was 7.3g; 7-10 year olds have a target of 5g, their outturn was 6.6g and for 4-6 year olds the target is 3g, their outturn was 5.8g.

Our NDNS analysis for children shows that intakes[102] of saturated fat (average of 14% of food energy obtained from saturated fat) in 1997 were higher than the COMA (Committee on the Medical Aspects of Food Policy) recommended level (of 11%). In addition, the NDNS 2000 shows that around half of the men and women aged between 19-64 in the survey had blood cholesterol level above the normal range.

Non-milk extrinsic sugars (NMES) are those sugars not naturally incorporated in the cellular structure of the food. There is extensive evidence that NMES[103] is the most important dietary factor in the cause of dental caries (COMA 1991)[104]. Although NMES are not directly related to the development of cardiovascular disease or diabetes, increased consumption can increase the intake of food energy and be associated with obesity. In predisposed people, foods high in NMES could have potentially undesirable metabolic effects such as elevation of blood glucose and insulin concentrations. COMA specifically recommends that NMES should not provide more than 11% of food energy intake. NDNS in 1997 reported that intakes of NMES are much higher than recommended in children – over 16%.

The Department for Health's White Paper considered these three areas of significant nutrient intake concern in England. As the table below shows for the UK, even small reductions in these daily average intakes on a nation-wide basis can lead to significant numbers of lives saved per annum. This table has been updated by Department of Health and FSA economists as our understanding of the dietary effects of these nutrients develops – see Annex 7 for more detail.

[101] Keys et al 1986
[102] Across all 4-15 year olds.
[103] Extrinsic sugar – lactose in milk and milk products is deemed to be a special case as it is less harmful than other sugars and milk does contain other protective factors.
[104] Annex 6 provides a brief description of the costs of dental caries and anaemia to the NHS. However, as these are relatively small compared to CVD and cancer their costs are not incorporated in the main benefits estimation exercise.

Annual UK deaths prevented for unit reduction in salt, saturated fat and sugar[105]			
	Level of reduction	*Causes of Deaths*	*Deaths prevented*
Salt	One gram reduction	CHD, stroke	6,730
Saturated fat	One percentage point reduction in saturated fatty acids, as % of food energy intake	CHD[106]	1,550
Sugar	one percentage point reduction in sugars, as % of food energy intake	All causes, via reduction in obesity	2,000 – 5,800[107]

When we considered the potential effect on childhood intake of salt, saturated fat and NMES of a successful substitution from the core category products consumed in 1997 to the NDNS modeled alternatives, significant reductions were achieved for each nutrient group.

Within the NDNS modeling, a 100% successful substitution yielded an average 0.9g daily reduction in child salt intake. If this effect were mapped onto the UK's adult population, this would equate to an annual prevention of 6,050 deaths. For saturated fat a childhood daily average reduction of 1.0% of food energy intake was achieved. This would equate to an annual prevention of 1,550 UK deaths. Children disproportionately consume NMES compared to adults. The Government's White Paper target for adult NMES reduction is 1.7% of food energy intake, this was comfortably achieved within the modeling of child substitutions which in themselves would equate to an annual prevention of 12,500[108] UK adult deaths (see Annex 7).

In addition to these nutrient effects discussed in the White Paper, Department of Health economists have now also been able to estimate the annual UK cancer deaths that could be prevented as fruit intake is increased. This is again explained in Annex 7. As modeled via the NDNS at 100% successful substitution, childhood daily intake of fruit would increase by 100g – this, along with the full substitution modeling results, is explained/presented in Annex 6. This increase in fruit intake is estimated to yield an annual prevention of 31,050 UK adult cancer deaths[109].

If it were the case that the proposed policy to restrict broadcast promotions to children drove the substitutions in children's diets modeled and that this prevented them from extrapolating their current dietary intakes into adulthood then this outcome would be estimated to prevent approximately 50,000 deaths annually in the UK.

[105] Data in table uplifted to UK by population figures (ONS Population Trends 210, 2005).
[106] In addition to CHD, the WHO Technical Report 91, 6 (2003) notes that the risk of developing type 2 diabetes is probably increased with consumption of saturated fat. We do not propose here to attempt to quantify this effect but note that this is a further potential category of health cost that these policy considerations may act to reduce.
[107] Explanation of this range of potential outcomes is provided in Annex 7 (DoH: Forecast Health Benefits).
[108] In order to maintain this analysis's conservative approach to estimating potential health benefits, the lower end of the range of deaths prevented re NMES is focused upon as the results of the analysis are presented.
[109] In addition to the effects of fruit consumption on cancer, Annex 6 also notes recent work concerning its effect on cardiovascular disease.

Methods of Monetising These Health Benefits: WTP/VOL and QALYs

The monetisation of the value of these 50,000 potential annual lives saved from dietary change into adulthood as children are exposed to less broadcast core food category promotion has the potential to involve many complex issues such as human costs (not factored into the discussion of obesity costs above), economic productivity and health care costs in this dietary context. To derive one approximation of this value, the FSA proposes to use the Department for Transport's Valuation of Benefits of Prevention of Road Accidents and Casualties in 2003[110], which incorporates medical costs, output and human costs (using a willingness-to-pay methodology) to provide value of statistical life (VOL) estimates in situations where death results. However, this transport-based statistical value of life is derived from victims whose mode age of road death is 20-29 years (2003)[111]. In the context of dietary relate deaths (despite new trends such as the childhood obesity and its uncertain life-long effects) the majority will occur in later life.[112] This fact raises two issues in the current discussion. Firstly, do the productivity and NHS costs included in the transport VOL transfer to the case of dietary related diseases? Secondly, is it appropriate to use a willingness-to-pay methodology regarding risk reduction where people's life expectancy may be being reduced by a few years but not approximately a half of their lifetime?

As can be seen in the Treasury's guidance to managing risks to the public[113], the NHS and productivity elements of the VOL figure account for less than 7% of its total as the public's willingness-to-pay to reduce risk is significant and productivity is measured as output less of lost consumption given the fatality. The NHS costs are small as they relate to short term care following a (to be) fatal accident.

In the case of dietary related deaths it is probable that the patient will have received medical treatment pre-fatality well in excess of the costs associated with a transport accident. This said, the 6% of the VOL figure accounted for by loss of net output is likely to be lower for people whose working lives suffered productivity problems as a result of their dietary related medical conditions and whom at the time of death may have been retired. Given these likely offsetting effects it is proposed here to employ the transport VOL figure as is.

The Treasury's guidance to managing risks to the public explains some of the advantages and disadvantages associated with both the VOL approach to measuring public benefits and the approach using Quality Adjusted Life Years (QALYs).

QALYs are an output measure via which cost effectiveness analysis can compare the costs of alternative ways of producing the same or similar outputs. QALYs are estimated by assigning every life-year a weight on a scale where one represents full health and zero represents death[114].

[110] Department for Transport, Highways Economics Note 1, December 2004
[111] www.dft.gov.uk/stellent/groups/dft_transstats/documents/page/dft_transstats_041053.pdf
[112] For example, it is in later middle to older age that numbers of deaths via colorectal cancer increase significantly. See: http://info.cancerresearchuk.org/cancerstats/types/bowel/mortality/.
[113] Managing risks to the public: appraisal guidance. HM Treasury, June 2005.
[114] For the most common methods of determining the health related utility values to weight QALYs see, Managing risks to the public: appraisal guidance. HM Treasury, June 2005. P22.

In the current context this second approach provides a measurement of the yield of QALYs from the increased life expectancy and reduced morbidity that are modeled to come as a result of restricting the broadcast promotion of core category foods to children. These QALYs are then monetised as explained later.

Turning to productivity costs and QALYs. QALYs represent the potential patient's subjective valuation of different health states. The values reflect loss of income whilst patients are unable to work. But this is only the difference between earnings and sick pay or invalidity benefit. As such, most of the value of production loss will not be taken into account. This said, the National Institute for Clinical Excellence (NICE) practice is not to adjust QALY evaluations for production losses. In this analysis we plan to keep to this precedent. In addition, there are also arguments that including production losses would distort the allocation of health care against those not in work.

In terms of NHS costs and QALY analysis, unlike in VOL where we have offset probably lower productivity with potentially higher NHS costs. In QALYs we are not including productivity and a case can also be made for excluding NHS costs here. To date, the discussion of NHS costs regarding dietary related diseases has tended to abstract from potentially shorter life expectancies. Given this the net cost effect is yet to be fully determined for dietary diseases. Indeed, there is at least the potential for it to be negative as opposed to positive. As such NHS costs are not considered with QALYs here.

Some analysts may think it more appropriate to apply the QALY methodology in the current situation, given the likely relative older age of average dietary related deaths. However, others would point to the general findings of willingness-to-pay experiments[115] that longer life expectancy does not necessarily yield higher willingness-to-pay valuations and that "dread" of certain health risks, such as cancer[116], can be better captured via the VOL methodology.

Whilst in general the QALY methodology may have more credibility in the current context, the FSA does not consider it appropriate to finally conclude that the traditional use of QALYs is the correct monetising tool here. A key reason for this being the growing understanding of researchers that in empirical WTP studies most people exhibit a "pure value of living" per se which is not trivial. As using traditional money values for QALYs will fail to capture this effect, the FSA considers it best to report both the QALY and WPT/VOL monetised figures as a range within which the true value is expected to lie.

The importance of the pure value of living element of such analysis has been raised by Professor Michael Jones-Lee of the University of Newcastle upon Tyne Business School. In explaining his and colleagues' research relating to WTP analysis he has told the FSA that:

"It seems pretty clear both intuitively and from the empirical evidence that some sort of pure value of living exists for most people. So, to ignore it completely and treat the extension of a sick 80 year old's life by, say, two years as being only "worth" two times the value of a QALY just seems to me to be misguided."

[115] *ibid*. P49.
[116] *ibid.* P50.

Whether it is more salient to employ either the VOL or QALY methodology, as well as mortality the morbidity effects of dietary related disease also need to be accounted for. To do this, for both VOL and QALYs, we propose using the ratio of the number of non-fatal events prevented per fatal event associated with the key nutrient intakes of salt, fat, sugar and fruit.

The Potential Monetised Benefits Using VOL

The value of statistical life was calculated as £1.42m in Q4 2004.[117] Applying this figure to the estimated potential 50,000 annual lives saved, an estimated benefit of £70 billion per year arises from prevented deaths alone – before we consider morbidity benefits.

As is explained fully with the QALY method of monetising these health benefits below, we consider it appropriate to apply a 10% uplift on the mortality outturns to also capture the effect of reduced morbidity.

To reach these figures we have assumed that the policy to restrict broadcast promotion of core category foods to children has been fully successful in delivering the modeled dietary substitutions and that the achieved reductions in salt, fat and sugar and increases in fruit are fully mapped into adulthood.

Whilst total success of the policy in achieving our modeled substitutions is unlikely, we again consider a 10% policy success effect to be an achievable base case. Results at the 10% figure are thus reported below.

We have also explained what evidence exists tracking childhood consumption of the wider nutrient categories into their associated levels of adult consumption. Given both the mapping of adolescent obesity into adulthood (70%) and the strong and developing tracking evidence of early childhood nutrient intakes through time. We consider it appropriate to report mapping levels of 25%, 50% and 100% relating to the level of the modeled reduction (increase for fruit) in nutrient intake as children's intakes track into adulthood. Indeed, we propose using a 50% mapping ratio as the base case[118].

As the majority of diet related health outcomes will tend to occur in later life, the benefits from children's substitution today towards a healthier diet will mostly accrue in decades to come. Given this it is necessary to discount today's monetary values of these benefits appropriately.

For this purpose we use the Government's Social Time Preference Rate[119]. By discounting the benefits by each of 50 and 60 years we obtain the equivalent present value of these future benefits that would accrue to today's 15 year old when they are 65 or 75 years old when the diet related disease caused mortality[120].

[117] This was derived from the value of statistical life in June 2003 provide by the Department for Transport (£1,312,260) and inflated to 2004 Q4 prices via the GDP per capita inflator between Q2 2003 and Q4 2004 (taken from ONS, Economic trends)

[118] This 50% base case is aimed at giving an average estimate of the monetised outcomes should approximately 50% of the intake substitutions be maintained into adulthood; with reductions coming both from complete reversal of substitution for some people and partial reversal for others.

[119] The Green Book, Appraisal and Evaluation in Central Government (2003). HM Treasury. P99

[120] As advised by the Green Book, we have discounted the first 30 years at the rate of 3.5% and applied the rate of 3.0% for the longer-term discounting beyond that.

However, (for both the VOL and QALY outturns) whilst the gain in life years will come typically in people's seventies, the benefits in terms of morbidity rate are likely to come earlier, perhaps with a lag of fifty years. Given this for our base case we discount mortality for 60 years and morbidity for 50 years.

The table below reports results for the 10% policy success effect in terms of the annual VOL monetised benefits of this policy via reduced UK mortality and morbidity from dietary related diseases.

UK Annual Monetised Health Benefits; VOL	100% mapping of nutrient intake substitution into adulthood	50% mapping of nutrient intake substitution into adulthood	25% mapping of nutrient intake substitution into adulthood
Undiscounted	£7,990m	£3,995m	£2,000m
NPV discounted 50-years: mortality and morbidity	£1,575m	£790m	£395m
NPV discounted 60-years mortality; 50-years morbidity	£1,210m	**£605m**	£300m

As can be seen, even when discounted for as long as 60 and 50 years (mortality and morbidity respectively), **our base case result using the VOL methodology estimates this policy to yield in excess of £600 millions of annual health benefits to the UK.** Indeed this annualised benefit can be seen as applying in perpetuity as successive generations of children develop healthier lifetime dietary patterns and habits.

It is also worth once more noting the potentially conservative nature of this figure given that: our modelling was not able to provide pre-prepared convenience foods with potential healthier substitutes; we only consider the effects of fruit consumption (and not vegetables) on cancer; and some dietary illnesses and deaths occur in younger children and adults, however we have discounted all of our effects decades into the future. In addition, if any healthy reformulations of core category foods were to be an indirect outcome of this policy then many adults would also benefit from shorter term healthier eating as well.

The Potential Monetised Benefits Using QALYs

We now illustrate the consequent yield of quality adjusted life years from increased life expectancy and reduced morbidity and monetise these. For example, fruit consumption protects against cancer. A high proportion of cancers are fatal within five years. But quality of life is progressively impaired in this period between diagnosis and death; and many people whose cancer is eventually cured anyway suffer a lower quality of life while they have it. Accordingly, as we have recognised in the VOL estimates, there is a benefit of reduced morbidity to be calculated in addition to the gain in life expectancy.

The table below converts deaths averted into life years saved and morbidity prevented. These estimates relate to 100% policy success substitutions maintained through adult life. They relate to the lifetime experience of a single age cohort. The assumption is that one year's expenditure on broadcast food promotion affects a single age cohort. See Annex 7 for the full evidence and analysis underlying these estimates.

UK change in risk factors: deaths averted, life years saved and morbidity prevented

	change	deaths averted	life years saved th	morbidity: QALYs gained th
salt	0.9 gm reduction	6,050	54	11
fat	One percentage point reduction in fatty acids as % of energy intake	1,550	18	1
sugar	The reduction in calories reported in Annex (Changes in Obesity)	12,500	215	16
fruit	100 gms/day increase	31,050	346	43
total		51,150	633	71[121]

It remains to express the life years saved in QALY terms, to value the QALYs, and to bring them to a present value to deliver comparability with cost, which will be incurred immediately.

As noted already, the gain in life years will tend to come towards the end of a normal life span. To judge from the Health Survey for England, older people do not have full quality of life[122], with a deficit of 0.25 each year. This proportion has been deducted from life years to arrive at the total of QALYs linked to gains in life expectancy.

The value people place on a QALY is uncertain. We use the figure of £30,000 in this context. This figure comes from different sources: the value NICE is widely believed to apply as a passmark in appraisal of health technologies; a recent study of air pollution for DEFRA[123];

[121] On average across the nutrients under consideration, an uplift of 10% on mortality for morbidity is applied (71/633).
[122] http://www.archive.official-documents.co.uk/document/doh/survey96/tab5-29.htm
[123] http://www.defra.gov.uk/environment/airquality/airpoll_health/index.htm

and a study for DoH of willingness to pay for a QALY, which takes as a starting point the DfT value of a statistical life[124].

As with the VOL calculations, we now again employ the 10% success rate base case of the policy in achieving our modelled substitutions for children's diets and report this at mapping levels of 25%, 50% and 100% into adulthood diets. Once more we also discount mortality for 60 years and morbidity for 50 years.

At the 10% policy success level, the achieved magnitude of UK health benefits expressed in QALYs is 54,500 QALYs per annum. The table below monetises this and provides the relevant NPV outturns.

UK Annual Monetised Health Benefits; QALYs	100% mapping of nutrient intake substitution into adulthood	50% mapping of nutrient intake substitution into adulthood	25% mapping of nutrient intake substitution into adulthood
Undiscounted	£1,640m	£820m	£410m
NPV discounted 60-years mortality; 50-years morbidity	£250m	**£125m**	£65m

As can be seen, even when discounted for as long as 60 and 50 years (mortality and morbidity respectively), **our base case result using the QALY methodology estimates this policy to yield £125m of annual health benefits to the UK.** Again, this annualised benefit can be seen as applying in perpetuity as successive generations of children develop healthier lifetime dietary patterns and habits.

The Precautionary Principle

When conducting cost benefit analysis to help formulate policy it is important to identify any truly uncertain outcomes that simply cannot be accurately forecast or measured today. As has been explained, the growth in childhood obesity in the UK has burgeoned in recent years. As a consequence of this so too have childhood diseases that historically tended to be the preserve of adults (some of which are irreversible), key of these being Type 2 Diabetes[125]. In addition, it is widely accepted that obesity is associated with cancers such as colon and ovarian[126].

Whereas the health and life expectancy effects of obesity and its associated medical conditions in adults are increasingly understood by the medical profession with forecast monetised benefits being produced as a result. The effects of very long-term (i.e. from

[124] Mason H, Marshall A, Jones-Lee M, Donaldson C for the Social Value of a QALY Project Team. Estimating a willingness to pay based value of a QALY from existing contingent valuation studies of prevented fatalities. 2004.

[125] BBC News, Child Diabetes Time-Bomb Warning, 19 April 2005. "Ten years ago type 2 diabetes was unheard of among children, but it has begun to emerge as the obesity epidemic has exploded." "Experts said there may be up to 1,500 cases nationally now and warned the UK was sitting on a 'time-bomb'".

[126] Tackling Obesity in England: HC 220 Session 2000-2001: 15 February 2001. P59.

childhood) obesity and its related conditions over an almost entire lifetime are not well known. This is simply because significant numbers of obese children is a new phenomenon.

Given this it appears necessary to apply the precautionary principle to policy formation when considering the appropriate action regarding the broadcast promotion of core category foods to children. The quantified benefits presented in this analysis from various levels of "success" in restricting the broadcast promotion of core category foods to children are based on the effects of diet on the population of England as is today (uplifted for the UK). As such these quantified effects do not yet capture the life-long health effects created by the new phenomenon of increasing numbers of obese children which can lead to irreversible health conditions, for example, life-long Type 2 Diabetes. In addition, it is likely that the sooner the UK's children become obese and in larger numbers the onset of other obesity related conditions may occur at earlier ages, e.g. the associated cancers.

As there is thus real scientific uncertainty regarding the longer-term (life-long) health effects being created by burgeoning UK childhood obesity which are clearly on the down side and may be significantly adverse, a precautionary policy approach should be applied. Annex 8 provides the Government's definition of the precautionary principle and further explanation regarding when it is appropriate to invoke it.

As such, the monetised benefits presented above relating to restricting the broadcast promotion of core category foods to children (concerning all nutrient intakes) may not fully take account of the potentially significant life-long health effects of rising childhood obesity and its associated (some irreversible) medical conditions.

Conclusion

The analysis laid out in this benefits of restricting the broadcast promotion of core category foods to UK children concludes that when appropriately discounted the base case yields present value annual health benefits of between £125m and £600m.

Again, it should be noted that these figures may be conservative given that: our modelling was not able to provide pre-prepared convenience foods with potential healthier substitutes; fruit's increased consumption effects on cancer alone are estimated, not vegetables; and some dietary illnesses and deaths occur in younger children and adults. There is also the potential effect of any healthy reformulations of core category foods (as an indirect outcome of this policy) feeding into the diets of many current adults.

Finally, we have also noted the potential role for considering the precautionary principle when framing policy in this area.

Annex 1 (2005 US Research into the Effects of Fast Food Restaurant Television Advertising on Childhood Obesity)

In April 2005 Grossman et al.[127] studied the impact of fast food restaurant advertising on childhood obesity in the US. As is noted below and by the authors, their findings suggest significant impacts of this form of broadcast promotion on childhood obesity outturns in the US. It is also important to note that the methodology employed by these authors, given the available US data, allowed them to estimate the effects of television advertising on childhood obesity without requiring to model nutrient substitutes or dose responses from calorie intake to BMI/obesity outcomes (these steps are necessary in our analysis for the UK).

This US study employed two micro-level data sets: the National Longitudinal Survey of Youth 1997 for adolescents aged 12-18 and the Child-Young Adult National Longitudinal Survey of Youth 1979 for children aged 3-11. Both are nationally representative.

Fast food restaurant television advertising data was obtained from Competitive Media Reporting, which holds exposure information and dollar expenditures for a wide range of fast food restaurant chains in the US from 1996-1999. The unit of observation used was the Designated Market Area, a region composed of counties that defines a television market. Network television, syndicated television and cable network television were not included as they do not exhibit any local variation.

Amongst the various results presented, when television watching time and fast food restaurant advertising messages seen are explanatory variables, the results indicate a positive and significant relationship between advertising and children's (age 3-11) BMI, with a larger and more significant impact on boys than on girls. Increasing exposure to fast food advertising by a half an hour per week was found to increase a boy's BMI by 2% and a girl's by 1%. However, the messages seen variable is not significant for adolescents, thus not predicting changes in BMI.

In the round the authors state that: "Our results indicate that a ban on these advertisements would reduce the number of overweight children ages 3-11 in a fixed population by 10 percent and would reduce the number of overweight adolescents ages 12-18 by 12 percent."

It should again be noted that as the advertising statistics used were based on the number of spot television messages seen per week, they exclude advertising on national television programmes. In addition we also note that only fast food restaurant advertising is considered here, other core category TV advertising is not.

Of final note is that the probability of childhood obesity persisting into adulthood is estimated in this paper to increase from about 20% at four years of age to approximately 80% by adolescence. Indeed, this later estimate appears to concur with the view of the Parliamentary Office of Science and Technology that overweight adolescents have a 70% chance of becoming overweight or obese adults in Britain.[128]

[127] Shin-Yi Chou, Inas Rashad, Michael Grossman (December 2005). Fast Food Restaurant Advertising on Television and Its Influence on Childhood Obesity. NBER Working Paper No. 11879.
[128] September 2003, Postnote Number 205

Annex 2 (NDNS Substitution Model)

Category	NDNS food group / food codes	Scenarios for effect of action on promotions to children	Notes for modelling
Crisps and savoury snacks	NDNS group 42R – crisps and savoury snacks. Includes all potato and cereal-based savoury snacks	Substitute with fruit	Substitute with average of Banana (NDNS code 1977) Apple (NDNS code 1951)
Soft drinks with added sugar	NDNS group 57A, B, C – non-diet soft drinks. Includes carbonated, concentrated and RTD still varieties. Excludes fruit juice. Excludes diet soft drinks	Substitute with a mixture of water, semi-skimmed milk and fruit juice	Average of Water (5000) Semi-skimmed milk (8543) Mixed fruit juice (2357)
Sugary breakfast cereals	No NDNS group for this category. Select food codes for sugary products. Breakfast cereals that exceed 18g total sugar per 100g	Substitute with breakfast cereals that meet nutrient profiling criteria Shredded wheat (Nutrient profiling score of = -6), Ready Brek (-5), Weetabix (-3); muesli with no added sugar (-2).	Average of: Shredded wheat (code 221) Ready Brek (2675) Weetabix (225) NB. Muesli with no added sugar not included as sugar content in NDNS nutrient databank is higher.
Confectionery	NDNS food groups 43 and 44 – sugar and chocolate confectionery	Substitute with fruit	Substitute with average of Banana (NDNS code 1977) Apple (NDNS code 1951)
Fast food - Pizza	Pizza – NDNS food group 1C NB: NDNS coding system doesn't distinguish takeaway pizzas from retail	Pizza – substitute with pizza that meets nutrient profiling criteria Takeaway pizza fish topped – example of healthier choice in Annex C of consultation package.	Substitute with NDNS code 8528 – chicken pizza deep pan base. Nutrient profiling score = +1 No suitable NDNS codes available for takeaway pizza fish topped.

Fast food -Burgers;	Burgers – separate list of NDNS codes	Substitute with 50% sandwich and 50% meat based ready meal	MW6[129] chicken salad sandwich (nutrient profiling score = 0) White bread 49% (code 120) Chicken 25% (code 1090) Tomato 10% (code 1931) Lettuce 6% (code 1762) Cucumber 6% (code 1740) Fat spread 4% (code 866) MW6 cottage pie ready meal (nutrient profiling score +3) NDNS code 1356
Fast food –Chicken (KFC / nuggets);	Chicken (KFC & nuggets)	Substitute with 50% sandwich and 50% chicken based ready meal	MW6 chicken salad sandwich (as above) MW6 chicken curry with rice (nutrient profiling score =0) NDNS code 9386

[129] McCance and Widdowson's The Composition of Foods, 6th edition.

Annex 3 (Obesity Measurement)

There are several different methods of measuring adiposity, the amount of fat in the body, in adults. Obesity and overweight are excesses of body fat but are defined by cut-off points in the measure of adiposity. Different measures of adiposity offer different theoretical and practical advantages. As obesity is a risk for several different diseases, the measure would ideally categorise those individuals are most risk from the disease as obese or overweight. Measures such as deuterium dilution and underwater weighting are accurate measures of fat, but prohibitively expensive for large and regular studies. Anthropometric measures are cheaper to use and still provide the opportunity to measure areas of body fat that observe the distribution of fat across the body. This allows, for example, an assessment of the fat stored around the waist, which is considered to be a significant risk factor for chest movements and breathing functions, as well as diabetes, hypertension and blood lipid concentrations.[130] Body fat distribution can be measured through comparisons of skinfold thickness; body circumference; or diameters at different parts of the body. Commonly used ratios include waist to hip ratio, waist circumference, and subscapular to triceps skinfold[131]. However, the most commonly used measure of obesity is the Body Mass Index (BMI). This is a ratio of the weight of the individual to their height, as shown in the formula below:

$$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in metres})^2}$$

$$= \frac{\text{weight in pounds}}{(\text{height in inches})^2} \times 704.5$$

Given this measure of adiposity, cut-off points have been suggested that correspond to mortality and morbidity risks. For adults, these are shown in the table below.

BMI (Kg/m^2)	Classification
< 20	Underweight
20 – 25	Healthy
25 – 30	Overweight
30 – 35	Obese
35 – 40	Severely obese
> 40	Very severely (morbidly) obese

This measure is used mainly due to its ease of application. As the measure requires only weight and height there is opportunity for measurements to be self-reported. Weight is reasonably correlated with body fat whilst height is only very weakly correlated with fat. The high correlation between the two means that it provides a good proxy for adiposity. BMI, however, is a measure of adjusted weight rather than fatness per se and hence some individuals will test false positive. This is the case with muscular individuals such as sports players.

[130] Royal College of Physicians. Storing up problems: the medical case for a slimmer nation. Report of a working party 2004.
[131] Power, C., Lake, J.K., Cole, T.J. Measurement and long-term health risks of child and adolescent fatness. International Journal of Obesity (1997).

Whilst BMI is still a valid measurement for children, the classification used for adults is not appropriate for use with children. This is because children are growing, and the body mass development is not linear throughout a child's development. In addition, due to the different growth patterns between girls and boys, there are separate thresholds for each sex at each age. It has been challenging for experts to define a given BMI for each age category to represent the cut-off points for obesity and overweight. One such way is to define obesity relative to the complete set of measurements in the study. If obesity is defined in relation to the complete set of individuals in any given survey then it is difficult to track changes in obesity over time. A way to avoid this is to freeze the cut-offs for a particular survey year and compare all subsequent results to that measurement. Such is the case in the UK. In England, there is an annual health survey, the Health Survey for England (HSE) that measures BMI. For the measurement of childhood obesity, reference values are taken from the 1990 Survey. This covers children from age 2 – 15 (children below age 2 have only recently been included in the measurements so no corresponding reference values exist). This measure is deemed the most appropriate for national analysis as the composition of the datasets is consistent. The cut-off for overweight has been set at the 85th centile and the cut-off for obesity has been set at the 95th centile. These values are shown below. The now stylised setting of the cut-off points at the 85th and 95th centiles in England/Britain is essentially arbitrary (see Cole et al. 2000)[132], but it is employed in this benefit analysis as it has become the norm for British childhood obesity study.

	85% Reference value		**95% Reference value**	
Age	**Males**	**Females**	**Males**	**Females**
4	17.13	17.23	18.08	18.32
5	16.96	17.16	17.95	18.35
6	17.01	17.32	18.10	18.65
7	17.24	17.71	18.48	19.22
8	17.61	18.23	19.04	19.93
9	18.08	18.82	19.70	20.70
10	18.64	19.49	20.42	21.52
11	19.27	20.23	21.16	22.34
12	19.94	21.00	21.94	23.20
13	20.66	21.75	22.75	24.03
14	21.40	24.46	23.56	24.80
15	22.13	23.09	24.34	24.46

The table below illustrates the proportions of children by age groups 4-6, 7-10 and 11-15 who were classified as obese in the Health Survey for England, 2002[133][134]. These figures help to give a feel for the sizeable nature of the obesity issue facing the nation's children.

Age/Sex	4-6 years old	7-10 years old	11-15 years old
Obese Boys	13.2%	16.1%	18.3%
Obese Girls	11.8%	17.9%	18.3%

[132] Cole, TJ., Bellizzi, MC., Flegal, KM., and Dietz, WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;320:1240 (6 May)
[133] HSE 2002, Table 9.6. TSO.
[134] Numerical averaging across ages in each grouping has been used.

Annex 4 (Obesity Dose Response Function)

An FAO/WHO/UN publication "Human Energy Requirements"[135] sets out the determinants of energy expenditure in children and adolescents. Energy expenditure depends on a child's basal metabolic rate (BMR), physical activity level (PAL), and growth. BMR is the energy used at rest. It is partly constant and partly proportional to weight. PAL depends on the mix of activities of different intensity undertaken within a given period, the child's "physical activity ratio" (PAR), and the proportion of time spent on each. It is proportional to the BMR and in this way creates another link between body weight and energy output. In children and adolescents growth contributes approximately 1% on top of other energy requirements and can thus be neglected for most purposes.

There are lists of the PARs of different activities, e.g. in the COMA report on dietary reference values[136].

The relationship between energy output, weight and physical activity level can be expressed as follows:

$$K = (\alpha + \beta W)\, p$$

where, K – daily calorie expenditure (kcal); W – weight (kg); $(\alpha + \beta W)$ – BMR; p – PAL.

In steady state, calorie output is equal to calorie intake. Following the work of Cutler, Glaeser and Shapiro[137], to calculate the effect of calories on weight we solve for W:

$$W = \frac{K - \alpha p}{p\beta}$$

Hence the effect on body weight of a one calorie per day change in energy intake is inversely proportional to the increase in BMR per unit of weight and the level of physical activity PAL:

$$\frac{1}{p\beta}$$

Thus by obtaining reference values of the BMR and PAL's of children we are able to estimate the effects on body weight and thus BMI of changes in daily calorie intake. Given the body weight changes estimated by this dose response function we can calculate changes in children's BMI using the height information contained in the HSE.

From FAO/WHO/UN - Human Energy Requirements (2001), it is estimated that β for 10-18 year old males is:17.686; and for 10-18 year old females is:13.384. From COMA DRV Table 2.4, it is estimated that the PAL for 10-18 year old males is:1.56; and for 10-18 year old females is:1.48.

[135] ftp://ftp.fao.org/docrep/fao/007/y5686e/y5686e00.pdf

[136] Dietary reference values for food energy and nutrients in the United Kingdom. Report of the panel on dietary reference values of the Committee on Medical Aspects of Food Policy. Report on Health and Social Subjects 41. Department of Health. 1991.

[137] Cutler DM, Glaeser EL, Shapiro JM. Why have Americans become more obese? J Econ Perspectives 2003;17:93-118.

Annex 5 (Changes in Obesity)

The nature of the modelling meant that the increase or decrease in nutrient intake was proportional to the percentage of substitution envisaged. As such it is easiest to report the nutrient differences that would be achieved via 100% substitution towards healthier choices and to factor these down with assumed policy success. The table below reports the 5%, 10% and 100% substitutions and the outturn daily calorie consumptions reported in the 1997 NDNS.

Age/Sex	1997 NDNS Reported Daily Calorie Intake (Kcals)	Modelled Daily Calorie Intake Reduction By Policy Success (Kcals)		
		5%	**10%**	**100%**
11-15 Boys (n=291)	2055	12	24	239
11-15 Girls (n=292)	1673	10	21	209
7-10 Boys (n=256)	1793	10	20	201
7-10 Girls (n=226)	1601	9	17	172
4-6 Boys+Girls (n=355)	1458	7	14	137

Given these reductions in calories, we can translate these into changes in BMI and subsequently changes in obesity and overweight prevalence (using the dose response function introduced earlier and average heights of children by age group). In the tables below we will concentrate on the results pertaining to the 11-15 year old groups of boys and girls.

Age/Sex	Implied Reduction in Child BMI[138] Via The Modelled Daily Calorie Intake Reduction By Policy Success		
	5%	**10%**	**100%**
11-15 Boys	0.18	0.35	3.52
11-15 Girls	0.22	0.44	4.41

Age/Sex	Implied Reduction in 2003 HSE Child Obesity Via The Obtained BMI Reductions By Policy Success[139]		
	5%	**10%**	**100%**
11 Boys	4%	7%	70%
12 Boys	3%	6%	55%

[138] For the child's BMI to reduce by the amounts cited, they must have consumed the relevant lower quantity of daily calories.

[139] Figures generated by scaling reductions linearly by percentage from 100% successful policy modelling.

13 Boys	3%	6%	64%
14 Boys	3%	6%	57%
15 Boys	3%	6%	55%
Average Boys[140]	**3%**	**6%**	**60%**
11 Girls	5%	9%	90%
12 Girls	4%	9%	86%
13 Girls	3%	7%	67%
14 Girls	4%	8%	79%
15 Girls	3%	6%	60%
Average Girls	**4%**	**8%**	**76%**

These BMI reductions are once more linear given the assumed percentage of policy success. The table above has been created by applying the 100% successful policy BMI reduction to the proportions of 2003 HSE obese and scaling down linearly by percentage. There are two reasons why this methodology has been employed as opposed to directly mapping the smaller percentage BMI reductions onto the 2003 obesity and overweight child distributions. Firstly, the sample size by each age in the HSE is approximately 220 and those classed as obese constitute a small minority of one of the BMI distribution's tails. In such a sample, the smaller the percentage of policy success assumed the more likely that the relevant BMI reduction fails to reclassify an obese child as non-obese. In the population as a whole even very small policy success percentages would act to statistically reclassify many children.

Secondly, for the population distribution by child age as a whole the nature of BMI distributions means that there will be more children clustered on or just above the cut-off for obesity compared to those even further towards the extremities of the distribution's tails who are severely or morbidly obese. As such smaller policy success percentages will actually act to disproportionately reclassify obese children as non-obese. Although the monetisation of the costs of obesity we discuss are presented for obesity as a whole, in reality the more obese a person is the greater the likely health and economic costs of their condition compared to a person who is closer to the obesity cut-off point.

[140] As can be seen for both boys and girls within this analysis. The older the age of the children within the 11-15 year old groupings (as noted earlier, this age grouping is necessary given relatively small NDNS sample numbers), in general the lesser the proportion of obesity removed by application of a common BMI reduction number. Investigation shows this has little to do with height and calorie intake averaging within this age grouping. Instead the driver is in longer BMI upside tails as children get older. This is illustrated by (pooled) boys and girls BMI distribution standard deviations increasing from 3.4 at 11, 3.8 at 12, 3.9 at 13, 4.1 at 14, to 4.3 at 15.

Annex 6 (Nutrition)

As can be seen from the fully reported NDNS modelling results below, in addition to the already reported salt, saturated fat and NMES results, complete substitution to the modelled healthier consumption pattern would increase NSP fibre intake by approximately 1.4g per day for 4-15 year olds. The remaining small percentages of 4-6 year olds and 11-15 year old girls that had 1997 outturn Vitamin C intakes (0.2% and 0.4% respectively) below the Lower Reference Nutrient Intake (LRNI)[141] would see this cured. Also, there would be reductions in the numbers of all 11-15 year olds and 7-10 year old girls who have folate intakes below the LRNI. In addition there would be increases in child consumption of some other advantageous nutrients, e.g. protein and calcium.

General Nutrient Substitution

	1997 NDNS Reported Daily Intake[142]	100% policy success Reduction/ Increase	1997 NDNS Reported Daily Intake	100% policy success Reduction/I ncrease
	11-15 Boys	11-15 Boys	11-15 Girls	11-15 Girls
Salt (g)	8	-0.9	6.6	-0.9
Sat. Fat (%FE)	13.5	-1	13.6	-1.2
NMES (%FE)	16.7	-6.5	16.3	-6.2
Protein (g)	66.6	+1.8	53.2	+1.1
NSP (g)	19.1	+1.7	16.3	+1.1
Iron <LRNI %	3.2	+1.6	45.6	-1.2
Calcium <LRNI %	11.6	-2.8	20.7	-7.1
Vit. C <LRNI %	0	0	0.4	-0.4
Folate <LRNI %	0.8	-0.6	3.8	-1.3

	1997 NDNS Reported Daily Intake[143]	100% policy success Reduction/ Increase	1997 NDNS Reported Daily Intake	100% policy success Reduction/I ncrease
	7-10 Boys	7-10 Boys	7-10 Girls	7-10 Girls
Salt (g)	6.9	-0.9	6.3	-0.9
Sat. Fat (%FE)	13.9	-0.9	14.1	-1

[141] The LRNI is the amount that is sufficient for only a few people in the population (2.5%) so if more than that are below the LRNI there is likely to be a risk of deficiency.
[142] Plus the constant uplift of 15% applied for salt. As it was not possible to decompose the earlier applied energy uplift by the nutrient groups presented in this table, no such uplifts are added.
[143] Plus the constant uplift of 15% applied for salt.

NMES (%FE)	17.8	-6.8	17	-5.9
Protein (g)	54.8	+2.1	51.2	+1.4
NSP (g)	16.6	+1.7	15.5	+1.2
Iron <LRNI %	0.6	0	3.1	+0.6
Calcium <LRNI %	1.6	-0.8	4.6	+0.1
Vit. C <LRNI %	0	0	0	0
Folate <LRNI %	0	0	2.4	-0.8

	1997 NDNS Reported Daily Intake[144]	100% policy success Reduction/ Increase
	4-6 Boys and Girls	4-6 Boys and Girls
Salt (g)	5.8	-0.9
Sat. Fat (%FE)	14.7	-0.9
NMES (%FE)	17.2	-5.9
Protein (g)	46.8	+1.4
NSP (g)	13.7	+1.3
Iron <LRNI %	0.3	0
Calcium <LRNI %	2.5	-1.7
Vit. C <LRNI %	0.2	-0.2
Folate <LRNI %	0	0

Fruit Substitution

Having computed total daily fruit and vegetable intake (in grams) for the five age/sex combinations of young people from the 1997 NDNS. We next make the modelled dietary substitutions that increase fruit consumption amongst children. As explained this involves the substitution of confectionery and savoury snack foods with fresh fruit, e.g. an apple or banana. The vegetable intake does not change because our model did not anticipate substitution to vegetables.

Pre-substitution

Age	4-6	7-10	7-10	11-15	11-15
Sex	All	Male	Female	Male	Female
Fruit	65.2	62.2	68.6	41.6	53.3
Veg.	58.9	58.3	68.7	77.7	77.4

[144] Plus the constant uplift of 15% applied for salt.

Post-substitution (of fruit for confectionery and savoury snacks - assumed 100% success; *approximate substitution outturn of **100g***)

Age	4-6	7-10	7-10	11-15	11-15
Sex	All	Male	Female	Male	Female
Fruit	151.1	170.6	167.0	155.0	156.9

Cancer

The intake of each of fruit, fibre, Vitamin C and folate have the potential to reduce the risks of dietary related cancers as diet is thought to play a role in about one-third of all deaths from cancer. There is a potential £1.1 billion of NHS cost savings alone that may accrue from improved UK diets. The NHS estimates that the net costs to it of cancer are £3.27 billion[145].

As an example of one type of cancer, colorectal cancer is the third most common cause of cancer deaths among both males and females and can be related to fibre intake. The death rates in 2002 were 25 per 100,000 males and 15 per 100,000 females[146]. However, as explained in Annex 7, to estimate the mortality effects of fruit intake on cancer in this analysis we turn to the EPIC-Norfolk study.

In addition to the beneficial effect on cancer risk, a recent article in the *Lancet*[147] has shown that increased consumption of fruit and vegetables is associated with a reduced risk of stroke. Compared to individuals who have less than three fruit and vegetable servings per day, those with three to five servings per day have an 11% reduction in the risk of stroke and those with more than five servings per day have a reduction of 26%. An overall increase in the consumption of fruit and vegetables could also reduce other cardiovascular disease. This effect occurs, firstly, through the potassium content of fruit and vegetables. Potassium has been shown to reduce blood pressure. Since raised blood pressure is the major cause of stroke, the blood-pressure lowering effect of potassium could be one of the major mechanisms contributing to a reduced risk of stroke with an increased fruit and vegetable intake. In addition, the dietary fibre contained in fruits and vegetables may contribute to the reduction in stroke risk by lowering blood pressure and cholesterol. Finally, fruit and vegetable consumption increases plasma antioxidants, which have been shown to reduce atherosclerosis.

Dental Caries

NMES sugar is thought to be the most important dietary factor in the development of dental caries[148]. The NHS cost of children's (under 18 years old) dentistry in 2003/04 in England is broken down as follows.

[145] DH, NHS Reference Costs 2004
[146] ONS, Social Trends 34, 2004 edition
[147] *Lancet* 2006; 367: 320-26
[148] This said, it is also recognised that factors such as tooth brushing and fluoride are also key.

Capitation payments (including the regular exam) totalled £228.7 million. Treatment fees totalled £104 million. This included exams (£20 million), photographs (£16 million), fillings, including root fillings (£45 million), extractions, including sedation costs (£12 million), treatment on referral (£8 million) and crowns and bridges (£3 million).

There are additional payments to dentists, which are the equivalent of a further 10% in fees. As well as this, children's work accounts for about £20 million of Personal Dental Services. Finally, there will be further costs for other NHS dental services for example, hospital services and community dental services (i.e. screening in schools).

Anaemia

Iron is used to produce red blood cells. A lack of iron can cause anaemia, which is common in children. As can be seen above, small decreases may result from our modelled substitutions in iron consumption for 11-15 year old boys and 7-10 year old girls. Anaemia is associated with a number of health problems; the most common of which is feeling tired, in addition there is evidence of a negative effect of anaemia on cognition. Using the national schedule of NHS reference costs, the national total cost of anaemia (for all sufferers) is £104,753,292. As with dental caries we cannot accurately estimate the effect of these reductions on NHS costs. Although we note that the reductions in iron intake are relatively small.

Annex 7 (DoH: Forecast Health Benefits)

Mortality

Salt

High blood pressure is a key risk factor for CHD and stroke. Categorising blood pressure as "high" does not, however, imply that levels below the threshold definition are benign. Observational studies indicate that the risks of blood pressure are continuous and graded[149].

Salt in the diet raises blood pressure. The INTERSALT study noted that a reduction of 3g/day could lead to an average reduction in systolic pressure of about 3.5mm Hg[150].

There is a target to reduce the population average intake of salt to 6g/day from 10g/day currently. Average systolic blood pressure would fall by 4.7mm Hg corresponding to about 3mm Hg diastolic. The effect on CHD/stroke mortality should be on some scale.

The evidence as to the effect of blood pressure on CHD and stroke is cast in the form of differences, e.g. a 5mm difference in diastolic blood pressure is associated with 34% less stroke[151]. For CHD the effect of a change in blood pressure is lower than for a prolonged difference of the same size[152][153]. Since intervention delivers change, we apply the results for changes, not differences.

Restricting food broadcast promotion to children should lead to changes in eating patterns, leading in turn to a modelled 0.9g reduction in daily salt intake. From the INTERSALT study this should lower diastolic blood pressure by 0.675 mm Hg.

We illustrate the impacts on lives saved and life years saved on the assumption that this difference persists into adult life and continues indefinitely. The impact would be to reduce CHD by 1.8% and stroke by 5.8%. Given this, the number of lives saved, assuming the reductions apply to fatal events – the trial findings relate to all events – would build up to annual totals of 1830 CHD and 3240 stroke, 5070 in all[154].

The next step is to infer the number of life years corresponding to the reduced risk of CHD and stroke. The metric illustrated below is the effect on population life expectancy at birth. The age specific death rates from CHD and stroke were reduced by 1.8% and 5.8%

[149] MacMahon S, Peto R, Cutler J, Sorlie P, Neaton J, Abbott R, Godwin J, Dyer A, Stamler J. Blood pressure, stroke and coronary heart disease: Part 1, prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. Lancet 1990;335:765-74.

[150] Law MR, Frost CD, Wald NJ. By how much does dietary salt reduction lower blood pressure? Br Med J 1991;302:811-24.

[151] Formally: $R_0^1 = k^{b_0 - b_1}$

where R_0^1 is the relative risk associated with blood pressure 1 compared with blood pressure 0; *k* is a constant with a value of about 0.93 for stroke and 0.98 for CHD.

[152] Collins R, Peto R, MacMahon S, Hebert P, Fiebach NH, Eberlein KA, Godwin J, Qizilbash N, Taylor JO, Hennekens CH. Blood pressure, stroke and coronary heart disease: Part 2, short-term reductions in blood pressure: overview of randomised drug trials in their epidemiological context. Lancet 1990;335:827-838.

[153] The reason may be that the period of follow up in the trials was not long enough to allow the full effect on CHD to come through.

[154] CHD accounted for 94,000 deaths, stroke 54,000 in England in 2003.

respectively throughout the age range. These reductions were subtracted from the corresponding all cause mortality rates. The gain in life expectancy was inferred from the difference in the area under survival curves. The impact on population life expectancy is about a month, 0.08 of a year, in both genders.

This gain in population life expectancy applies to the whole birth cohort of nearly 600,000 in England. The total number of life years gained annually is then about 45,000.

Saturated Fat

Serum cholesterol is a risk factor for CHD. Raised cholesterol accounts for a high proportion of CHD mortality.

If it were feasible, through whatever means, to ensure that no one had a cholesterol level above 5mmol/l, the potential reduction in CHD mortality could be around 45%[155]. The average at the date of this report was 5.5 in men, 5.6 in women.

Saturated fats in the diet influence cholesterol. A relationship has been established between changes in saturated fat and changes in cholesterol[156]. Since we are concentrating on saturated fat we implicitly hold the other variables constant. In that case a unit difference in the percentage of dietary calorie intake from saturated fatty acids leads to a 0.036 mmol/l difference in total serum cholesterol. Strictly speaking this represents the effect if carbohydrate replaces saturated fat for one percentage point of calories.

There does not appear to be any information as to the lag between a change in the intake of saturated fat and the change in cholesterol. The full effect of changes in cholesterol on CHD comes in within five years[157]. It attenuates with age. The estimates for a 0.6 mmol/l reduction in cholesterol are as follows:

Reduction in CHD for selected reductions in total cholesterol by age		
	reduction in CHD mmol/l	
	0.6	0.036
age	%	%
40-49	50	3.0
50-59	40	2.4
60-69	30	1.8
70+	20	1.2

[155]Britton A, McPherson K. Monitoring the progress of the 2010 target for coronary heart disease mortality: Estimated consequences on CHD incidence and mortality from changing prevalence of risk factors. Report to CMO. May 2000.
[156]Mensink RP, Zock PL, Kester ADM, Katan MB. Effects of dietary fatty acids and carbohydrates on the ratio of serum total to HDL cholesterol and on serum lipids and apolipoproteins: a meta-analysis of 60 controlled trials. Am J Clin Nutr 2003;77:1146-55.
[157]Law MR, Wald NJ, Thompson MG. By how much and how quickly does reduction in serum cholesterol concentration lower the risk of ischaemic heart disease? Br Med J 1994;308:367-73.

A reduction of 1% in fat intake – the modelled change from restricting food broadcast promotion to children – leads to a reduction in cholesterol of 0.036 mmol/l. In the absence of evidence as to the precise nature of the relationship between cholesterol and CHD mortality, the reduction in mortality from 0.036 mmol/l was assumed proportional to the reduction from 0.6 mmol/l (final column of table above).

The number of lives saved, assuming the reductions apply to fatal events – the trial findings relate to all events – would build up to 1300 CHD annually.

The next step is to infer the number of life years gained. The metric illustrated below is the effect on population life expectancy at birth. The age specific death rates from CHD were reduced by the age specific rates in the final column in the table above. These reductions were subtracted from the corresponding all cause mortality rates. The gain in life expectancy was inferred from the difference in the area under survival curves. The impact on population life expectancy is about twelve days for men, seven days for women, 0.033 and 0.019 of a year respectively.

This gain in population life expectancy applies to the whole birth cohort of nearly 600,000 in England. The total number of life years gained annually is then about 15,000.

Sugar

The FSA estimates that as a result of restricting broadcast food promotion to children food substitution would reduce calorie intake, leading in turn to a 60% reduction in obesity prevalence among boys 11-15, and a 76% reduction in girls in the same age group, assuming full success of the policy.

We illustrate the impact on life expectancy assuming that 70% of obese adolescents become obese adults. The prevalence of obesity in this age group is 18.3% for both boys and girls[158]. With a birth cohort of about 600,000 the numbers obese would be 55,000 boys and the same number of girls, of whom 38,400 of each sex would remain obese into adulthood. The effect of the food substitutions would then be to reduce the adult prevalence of obesity in an age cohort by 23,000 men and 29,200 women.

There are two leading sources of estimates of the life expectancy penalty attaching to obesity. One uses the Framingham longitudinal study and uncovers the life expectancy penalty of those who were obese at 40, about 7 years[159]. As the debate in the literature shows, this relates to average obesity of those obese in 1948 and whatever course their obesity subsequently takes. The other draws on NHANES and gives estimates by BMI by age by gender by ethnicity, on the assumption that the base BMI persists[160]. Loss of life expectancy increases with BMI and declines with age. A young man with BMI 35 loses three years of

[158] HSE 2002, Table 9.6. TSO.
[159] Peeters A, Barendregt JJ, Willekens F, Mackenbach JP, Mamun AA, Bonneux L for NEDCOM, the Netherlands Epidemiology and Demography Compression of Morbidity Research Group. Obesity in adulthood and its consequences for life expectancy: a life-table analysis. Ann Intern Med 2003;138:24-32.
[160] Fontaine KR, Redden DT, Wang C, Westfall AO, Allison DB. Life-years lost due to obesity. JAMA 2003;289:187-193.

life, four years for 36. In both cases the comparator is ideal weight so the estimates do not strictly relate to obesity, whose natural comparator is arguably non-obesity, i.e. BMI 29.

The selection of the value for the penalty is inevitably partly a matter for judgement. A figure of 3.5 life years is illustrated here, but it is as well to bear in mind that a higher figure is possible. The gain in life years is then just over 180,000 in a birth cohort. To monetise the benefit using a value of life requires an estimate of the number of lives saved, or more realistically, deaths averted.

We approach indirectly in a series of steps. The mortality ratio which delivers a 3.5 year loss of life expectancy is 1.415 in men, 1.45 in women[161][162], or 1.62 and 1.72 respectively against a non-obese comparator. This ratio reflects the increase in all cause mortality rates in each age group which would reduce population life expectancy by 3.5 years. It requires cautious interpretation as the implicit population attributable fraction implies a number of obesity deaths twice the NAO estimate. The mortality ratio which reproduces the NAO burden is much lower: 1.23 for men, 1.20 in women. We thus illustrate both sets of ratios.

We then estimate the difference in obesity prevalence attributable to the reduced intake of sugar. We assume that the current prevalence of adult obesity arose in adulthood and that the prevalence of current childhood obesity which persists into adulthood would be additional.

Deaths averted through reduced intake of sugar			
		m	f
proportion of obese adolescents becoming obese adults		70%	70%
obesity prevalence 11-15		18.3%	18.3%
proportion of adult population obese because obese in adolescence		12.8%	12.8%
percentage reduction due to policy		60%	76%
reduction in adult prevalence due to policy Δp		7.7%	9.7%
Relative mortality risk from obesity *r*	high	1.62	1.72
	low	1.23	1.20
Proportion of deaths averted[163]	high	4.2%	6.0%
	low	1.7%	1.9%
Number of deaths averted in cohort of 600,000		12,500	18,000
		5,000	**5,500**

Fruit

The FSA statisticians' modelling estimates that daily fruit intake would increase by 100 gm. The effect on life expectancy could be on a considerable scale if (a) these differences persist

[161] The comparator is the population as a whole. To rework to a non-obese comparator we use $(r - rp)/(1 - rp)$, where *r* is the ratio with a whole-population comparator, *p* is the obesity prevalence, taken as the 2003 average in adults: 22% for men and 23% for women.

[162] Restricting the excess rate to the over 20s, the starting age for the evidence on mortality from obesity.

[163] Applying the population attributable fraction – $\Delta p(r-1)/(pr+1-p)$.

through adulthood (b) the effects on cancer mortality implied by the longitudinal study EPIC-Norfolk apply[164].

EPIC-Norfolk results are organised by quintile of plasma ascorbic acid. The difference between neighbouring quintiles is roughly constant at 20mmol/l, corresponding in turn to 50 gm of fruit or vegetable consumption. It appears then that 100 gm increase in daily fruit consumption would promote the consumer by two quintiles in terms of cancer risk. We assume that those in the second top quintile would improve by one quintile and those in the top quintile would not change. The relative risks of cancer mortality by quintile and their share of cancer mortality are as follows:

Relative risk of cancer mortality and share of cancer mortality by quintile of plasma ascorbic acid				
q	m	f	m %	f %
1	1.00	1.00	30	27
2	0.74	0.76	22	20
3	0.51	0.61	16	16
4	0.57	0.64	17	17
5	0.47	0.73	14	20
			100	100

The reduction in cancer mortality would be highest in the lowest quintile of consumption: this quintile would also account for the majority of the impact on cancer mortality:

Reduction in cancer by quintile: contribution of each quintile to overall cancer reduction				
q	m %	f %	m %	f %
1	49	39	15	10
2	23	16	5	3
3	8	-	1	-
4	18	-	3	-
5	-	-	-	-
			24	14

[164]Khan K-T, Bingham S, Welch A, Luben R, Wareham N, Oakes S, Day N. Relation between plasma ascorbic acid and mortality in men and women in EPIC-Norfolk prospective study: a prospective population study. Lancet 2001;357:657-63.

On these assumptions cancer mortality would fall by 24% in men and 14% in women. The reductions are restricted to the age group 45 and over in line with the age range in the EPIC-Norfolk study.

The effect on population life expectancy would be on a similarly major scale, with an increase of two thirds of a year in men and half that in women. This gain in population life expectancy applies to the whole birth cohort of nearly 600,000 in England. The total number of life years gained annually is then about 290,000.

Morbidity

The number of non-fatal events should also fall with the substitute diet. We proceed by establishing a ratio: the number of morbidity QALYs lost per death from stroke, CHD and cancer.

There is evidence as to the prevalence with stroke and heart attack as well as deaths.

Heart attack and stroke: morbidity from non-fatal disease.

	Deaths[165]	Prevalence of survivors[166]	Survivors per death	QALY penalty[167]
Stroke	50,000	920,000	18.4	0.164
Heart attack[168]	87,000	1,100,000	12.6	0.055

These QALY penalties relate strictly to first events whereas many survivors will have had two or more events. Ideally, the QALY penalty should be derived from the Health Survey for England, which has individual data on health state (measured by QALYs) and CVD experience.

The number of morbidity QALYs per death is then about 3 for stroke and 0.7 for heart attack .

The mortality gains from salt are likely to be in the proportion 45% stroke 55% CHD.

Cancer requires a different approach. The annual incidence of cancer in England is about 200,000. The five year survival, which equates to cure, is about 36%. We assume no loss of quality of life after cure.

There appears to be no estimate of the QALY penalty suffered by those within five years of diagnosis. We deal separately with those destined not to survive five years, the decedents, and the others, the survivors.

[165] http://www.statistics.gov.uk/STATBASE/ssdataset.asp?vlnk=8986

[166] National Centre for Social Research and University College London. Department of Epidemiology and Public Health, Health Survey for England, 2003 [computer file]. Colchester, Essex: UK Data Archive [distributor], March 2005. SN: 5098.

[167] Clarke PM, Gray AM, Holman R. Estimating utility values for health states of type 2 diabetic patients using the EQ-5D (UKPDS 62). Med Decis Making 2002; 22:340-349.

[168] CHD

The cumulative five year mortality rate is 64%[169]. We assume that decedents' quality of life falls from 0.8 just before diagnosis to zero at death. On the assumption that quality of life declines steadily between diagnosis and death, the average QALY loss depends on the distribution of length of survival. Assuming that one fifth die each year, then the average decedent loses 1.2 QALYs between diagnosis and death. The QALY loss for each year's decedents is then about 155,000[170].

There is no guidance as to the QALY penalty suffered up to five years among those destined to survive. On no very strong basis, we use the QALY penalty attaching to a first heart attack, 0.055 QALYs a year. The average survivor then loses 0.275 QALYs. The QALY loss for each year's five year survivors is then 19,800[171].

The total QALY loss would then be 175,000 a year, about 1.38 QALYs per death, in addition to the loss of QALYs entailed by reduced life expectancy.

The benefits from reduced sugar intake are based on all cause mortality. In order to uncover the corresponding reductions in morbidity we must specify the diagnostic mix, as the different diagnoses have different ratios of events to deaths and different QALY penalties.

[169]Richards MA, Stockton D, Babb P, Coleman M. How many deaths have been avoided through improvements in cancer survival. Br Med J 2000;320:895-8.
[170]128,000 each losing on average 1.2 QALYs.
[171]72,000 each losing 0.275 of a QALY.

We rely on the diagnostic breakdown of obesity deaths from the Nurses' Health Study[172][173].

Diagnostic breakdown of obesity deaths	
	%
cardiovascular disease	16
cancer	57
other	27
	100

As we saw above the weighted average QALYs per CVD death is then 1.75. This compares with 1.38 for cancer. For "other" we adopt, conservatively the rate for CHD, 0.69. The QALY saving from reduced morbidity can then be expressed as 1.25 per death from obesity.

Given this and the estimated number of deaths averted explained above, the number of QALYs gained through reduced morbidity regarding sugar would then be 15,600-45,600 for the UK as a whole. The figures would also be 43,000 for fruit, 11,000 for salt and 1,000 for saturated fat.

[172]Manson JE, Willett WC, Stampfer MJ, Colditz GA, Hunter DJ, Hankinson SE, Hennekens CH, Speizer FE. Body weight and mortality among women. N Engl J Med 1995;333:677-85.
[173]Because obesity is a risk factor for breast cancer, it is likely that the diagnostic breakdown is different in men.

Annex 8 (Precautionary Principle)

The Green Book defines the Precautionary Principle as: "The concept that precautionary action can be taken to mitigate a perceived risk. Action may be justified even if the probability of that risk occurring is small, because the outcome might be very adverse."[174]

The UK Interdepartmental Liaison Group on Risk Assessment (UK-ILGRA)[175] considers that the precautionary principle should be invoked when: there is good reason to believe that harmful effects may occur to human, animal or plant health or to the environment; and, the level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision-making.

In the case of childhood obesity, the potential harmful effects of associated life-long medical conditions are characterised by factors such as: potential irreversibility; potential severity for long periods of time (i.e. life); significant and increasing numbers of children affected; and potential knock-on effects such as UK economic productivity.

Application of the precautionary principle needs to distinguish from other drivers that can lead to required caution. For example, society's view on the extent of protection afforded to children. This is the case in applying the precautionary principle in the current analysis as it would not be being invoked to protect children per se. It is simply recognising that obesity and its associated medical conditions are increasingly afflicting the UK population at younger ages with the (potentially longer-term) medical uncertainties that this brings.

[174] The Green Book, Appraisal and Evaluation in Central Government (2003). HM Treasury. P103
[175] www.hse.gov.uk/aboutus/meetings/ilgra

IA Annex B

FSA Rebuttal of the FDF Submission

FSA Rebuttal of the FDF Submission: *A Critical Appraisal of Ofcom Analysis of the Health and Economic Impact of Proposed Policies for TV Advertising of Food to Children*

[Please note: The response of the FSA is tracked into the FDF submission in italics].

1. The background evidence suggesting a causal link between TV advertising and children's calorie intake and obesity contains just two studies (Bolton 1983 and Grossman et al.). The Ofcom analysis discusses both papers but does not actually use any of the quantified evidence from them. Rather, Ofcom / FSA have built their own model based on assumed levels of food substitution.

2. The Bolton research is not supportive of the idea that large effects could be obtained by changes to TV advertising. It shows that parental calorie intake and other behaviours are dominant and that the direct association with children's TV advertisement exposure is minimal. It estimates that the number of snacks eaten per week would increase by only 1 (as a result of an extra 12 hours TV, including an extra 25 minutes direct exposure to food commercials). This snack is on average going to increase caloric intake by 1½ %. "The resultant food commercial exposure has very small effects (in practical terms) on children's nutritional status. Since children in this study are typically well nourished, it is unlikely that effects of this magnitude could seriously affect their nutritional and physical well-being". "Since the influence of television food advertising is very small, it is likely to be harmful only to those children who are not well nourished for other reasons." "Government and public policy to improve children's nutritional status will be more effective if it focuses on the key determinants of children's diets…since parental diets – not television food advertising – seem to be a major influence."

3. The equivocal nature of the Bolton evidence is not discussed in the Ofcom analysis. Equally important, the opportunity to use any of the Bolton data is ignored. Extrapolating the Bolton relationship, to achieve the calorie reduction suggested by the Ofcom report would require a reduction in each child's TV watching per week of 93 hours i.e. Children

would need to reduce their TV watching from 55% of their total waking and sleeping hours in a week down to zero. This suggests that the quantified results in the Bolton paper do not support the level of proposed reductions in Calorie intake in the Ofcom report

4. The Grossman research actually focuses on the effect of TV advertising on weight (as opposed to snacking as with Bolton) but is similarly unsupportive of large scale effects. The Ofcom report picks out only one of the Grossman analyses for discussion (Specification 2), giving no detailed discussion of the other Grossman analyses, which in some cases show no significant effect and in others show a much smaller scale. Grossman picks out in particular mother's weight status as the most strongly associated variable with children's weight issues (again reflecting the Bolton analysis concerning parental influence).

5. A crude analysis undertaken here shows that if the Grossman data were extrapolated then the reductions in mean BMI modelled would be small. The scale of impact assumed by the FSA is much larger than appears evidenced using the Grossman data.

6. The evidence is equivocal concerning whether there is a direct effect from children's advertising of food to obesity. Where some of the analyses do show an association, the effect is small in absolute terms and is much smaller than parental influence effects. Since the proposed policy change has no intended impact on parental influencing variables it is difficult to believe that significant effects on childhood obesity are likely to occur.

7. It is well evidenced that obesity is very hard to reverse, with a low success rate. No discussion of this evidence is given.

8. The Ofcom analysis barely discusses the real-life long-term experiments that have occurred when both Quebec and Sweden banned food advertising to children. Neither Quebec nor Sweden has seen successful reductions in childhood obesity after their advertising bans.

9. The single most important criticism of the Ofcom work is that the estimates of policy effectiveness used have no basis in evidence. The Department of Health analysis is undertaken assuming that 100% success is achieved in substituting foods. The FSA appear to acknowledge that this will not happen. An arbitrary 5% lower bound and 10% upper bound on policy effectiveness is assumed "to illustrate the effects". No evidence is given to support the choice of 5% or 10%. However, by the time we get to the economic and health impacts these are seen almost as upper and lower confidence intervals for a known effect within a range. And, by the time we get to the executive summary of the results only the 10% assumption results are presented.

10. Existing evidence is not used to quantify likely effects. Instead two arbitrary assumptions are made (a) the effect of banning food advertising will be to cause food substitution as described in the FSA scenario (b) the scale of the adoption of food substitution will be between 5% and 10%

11. There is no evidence presented to justify the choice of 5% or 10% policy effectiveness, nor why they might be considered upper or lower bounds. Equally feasible might be 4%

or 3% or 2% or 1% or even 0%. At a minimum one would expect to see systematic elicitation of expert judgement concerning the likelihood of policy success given the existing evidence. Better would be commissioned research to assess the scale of effect.

12. There is no actual definition given for 10% or 5% policy success. Does it mean: 5% of the people will achieve the substitution scenario set out and stick to it for the long-term? Or, 100% of the people will achieve just 5% of the substitutions – in which case significant changes in the proportion of obese children are unlikely; or 100% of the people will achieve the substitution but only 5% of the time dropping back to eating the original foods 95% of the time. In each case, because the children who are obese will require substantial changes in behaviour to achieve non-obese status, the results could be different.

13. Were this intervention a drug, it would not get a licence and it would not get NICE approval because the direct evidence of effect is not there.

14. There is no evidence presented at all concerning whether television advertising removal or reduction has any link to behaviour resulting in food substitution.

15. The food substitution assumptions used are fairly detailed but again not evidence based. There is no evidence provided for the assumptions concerning what foods would be substituted. For instance, is it realistic that Kentucky Fried Chicken would be substituted with a low fat chicken sandwich or a chicken based ready meal in the absence of advertisements?

16. Most importantly, there is not any evidence provided that backs the assumption that the scale of food substitution suggested by FSA is realistic. This is the fundamental problem with the risk impact analysis. No attempt is made to use the Bolton evidence or Grossman evidence on scale of effect.
    •
17. The majority of the benefits modelled are due to assumed increases in fruit intake, which in turn lead to reduced cancer risk. It is important to note the enormous scale of assumed fruit increase: Almost a threefold increase in fruit intake is assumed. Again no evidence is given to suggest that reductions in TV advertising will produce any increase in fruit intake, let alone one of this magnitude In addition it should be noted that there is plenty of evidence to suggest that even intensive recent campaigns to increase fruit and vegetable intake have failed to increase fruit intake by this sort of scale. Even with 10% or the assumed minimum 5% policy effects the underlying assumption is that removing TV advertising to children would produce a 30% or 15% increase respectively in daily fruit intake for children across the land on a permanent basis.

18. The obesity dose response function used is correct in theory for individuals but is applied assuming (a) that a "steady state" is in place before intervention (incorrect for individual children who are becoming increasingly obese) (b) that the values for basal metabolic rate and exercise level are set to be national average values (likely to be incorrect for those children who are already obese) (c) that every child of a particular weight will achieve exactly the same calorie reduction via food substitution.

19. 1997 UK evidence suggests that 11% to 13% of adults were obese as children in the UK. 1996 evidence suggests that 57% of American obese adults were obese as children (such

a large difference may be a question of definition?) The Ofcom analysis assumes that the UK proportion is actually 25% i.e. an arbitrary doubling of the UK evidence because "it is considered … a realistic base case". This has the effect of immediately and arbitrarily doubling the estimated reductions in adult obesity given the food substitution assumed to occur as a consequence of the policy.

20. Deaths saved for assumed changes in nutrients are calculated separately for salt, saturated fat, sugar and fruit. For salt the assumptions translating the assumed permanent reduction by 0.9g of salt into health benefits seem appropriate. For saturated fat the main issue would be that recent large-scale introduction of statins in the UK would reduce these calculated benefits. For sugar, and hence obesity there seems to be some disconnect between the FSA and the Department of Health analysis. The DH calculations use two different mortality risk increases to apply to obesity. These give considerably different answers in terms of lives saved, neither of which match those given in the FSA report.

21. It is the fruit and cancer risk computations, which give the most cause for concern. "It appears then that 100 gm increase in daily fruit consumption would promote the consumer by two quintiles in terms of cancer risk." "On these assumptions cancer mortality would fall by 24% in men and 14% in women." Such large-scale reductions in cancer mortality due to reducing TV advertising to children are effectively built on a series of assumptions lacking in evidence

22. The analyses of mortality impact appear to be done independently which means that there is overestimation of the CHD death effects. The deaths prevented due to salt reduction are CHD and stroke, as are those in the saturated fat analysis and presumably largely in the obesity analysis (though only partial details are given). It is unclear in the report, but the likelihood is that there is some significant double or even triple counting in the reduced number of expected deaths. Similarly the gains due to fruit are related to cancer death reductions as presumably are at least some of the deaths prevented due to the other nutrients. Again there should be no double counting.

23. There does not appear to be any analysis of competing risks. It is also important to note that if fewer people really do die of CHD then more will have the chance to move on to develop cancer as a competing risk and also more chance of developing other expensive to treat illnesses such as Alzheimer's or renal disease, causing cost increases in health and social care.

24. The NHS is currently investing large sums of money in treatment and prevention of CHD and cancers. Given this, the estimated risk reductions left after people's cholesterol becomes controlled using statins or colorectal cancers are prevented following the planned introduction of colorectal cancer screening will undoubtedly be smaller than those estimated here.

25. The scale of potential benefits estimated by Ofcom looks very high when compared with other literature. Grossman quotes Flegal et al. (2005) reporting approximately 112,000 excess deaths in the year 2000 due to obesity in the US. Given that the UK population is around 1/3 the numbers and with lower obesity rates, does it seem plausible even that the 100% successful version of the policy would in fact achieve anything like the estimated 51000 deaths per annum averted quoted ?

26. The transforming of health benefits into monetary benefits should probably use the QALY approach only. In general the QALY methodology has more credibility in health economic decision-making than the value of a statistical life approach. NICE guidance favours the QALY approach, as do other reimbursement agencies internationally. The QALY approach would account for two facts (a) that the lengthening of life would be lower than average because those benefiting will mostly be the elderly avoiding cancer, and (b) that it occurs in an age group, which suffers from other illness and hence less than perfect health.

27. The only monetised basecase results presented (p150 and p152) assume a 10% policy effect to be achievable. No reason is given as to why. If a 5% policy success were achieved then the results would halve.

28. The same "basecase" results also assume that only 50% of the nutrient changes that occur in childhood transfer through to adulthood, again with no evidence.

29. The same "basecase" results also assume that 25% of adults were obese as a child.

30. To see how important these assumptions are, a series of less optimistic assumptions have been made in this report. Substantial reductions in the benefits would occur. Depending on the assumptions made (and given a lack of evidence there is no clear sense that these might be less "realistic" than those selected by the FSA / Ofcom) then the benefits could reduce by 50%, 75% and even down to almost zero.

31. When compared against the costs (to advertisers) of implementing it is even possible that there could be a net detrimental effect, i.e. the economic costs to advertisers could potentially outweigh the very small (if any) health benefits obtained.

32. Finally, the only option analysed in any detail is "Package 1" with the impact of other options being assumed to be relative to this. There are several other potential policies, which could be relevant to the analysis, not least the promotion of healthy food advertising. None of these are explored.

33. In summary, the detailed analysis has some major problems in that the evidence for the each element of the chain from changing TV advertisement through to health and mortality and hence monetary benefit is either non-existent i.e. an assumption made, or of a smaller scale and weaker than would appear from a first reading of the Ofcom report. The report represents a what-if assumption based analysis rather than an evidence based analysis of the expected impact of policy change.

1. Quantifying the effect of TV advertising on children's calorie intake and obesity

The background evidence suggesting a causal link between TV advertising and children's calorie intake and obesity is reviewed on p137 of Annex 6. The only studies suggesting a link are Bolton 1983 [176] and Grossman et al. [177]. The Ofcom analysis discusses both papers but does not actually use any of the quantified evidence from them. Rather, Ofcom / FSA have built their own model based on assumed levels of food substitution. Here, the Bolton and Grossman evidence is reviewed, its strengths and weaknesses as evidence of any direct causative effect from TV advertising are discussed, and finally the mismatch between the scale of effect assumed by Ofcom / FSA versus that suggested by the facts is examined.

1.1 Bolton et al. and its use in the Ofcom analysis

The Bolton study was undertaken in 1983; some time ago in terms of obesity rises and TV culture. It examined daily TV viewing and weight amongst many other variables in "262 children aged 2 to 11 from two parent families with a working television set". The resulting predictive models involve a complex nested set of 5 equations relating 11 predictor variables to different 5 outcomes in turn

1. Food commercial exposure,
2. Snacking frequency,
3. Calorie intake,
4. Nutrient efficiency and
5. Nutrient balance

The predictor variables are

1. Parents commercial food exposure,
2. Parents snacking frequency
3. Parents caloric intake,
4. Parents nutrient efficiency
5. Parents nutrient balance
6. Parents television supervision
7. Parents diet supervision
8. Child's age
9. Child's missing meals
10. Child's food commercial exposure and
11. Child's snacking frequency

The results of the analysis (shown in Table 3 of Bolton) show that higher caloric intake in children is associated mostly with higher parents caloric intake (significance level < 0.01 i.e.

[176] Bolton, R. N., (1983). Modeling the Impact of Television Food Advertising on Children's Diets. Current Issues and Research in Advertising 1983.

[177] Shin-Yi Chou, Inas Rashad, Michael Grossman (April 2005). Fast Food Restaurant Advertising on Television and Its Influence on Childhood Obesity.

very strongly associated or in lay persons terms less than a 1% chance that the resulting association is just due to random chance in the data rather than a real effect).

Rebuttal:

Whilst it is indeed found in Bolton (1983) that high caloric intakes of children are associated with those of their parents, this point is not pertinent to the range of policy options that OFCOM have been tasked with considering.

Higher caloric intake is also positively associated with child's snacking frequency. The association with child's food commercial exposure is much lower at 0.01 and not significant even at the 0.1 level. In statistics, a result is significant if it is unlikely to have occurred by chance, given that in reality, the variable has no effect, thus a 0.1 significance level means that there is a less than 10% chance that the association found is due to random chance than a real effect.)

Figure 1 below uses the results from Bolton's Table 3 to show how dominant the parental calorie intake is in this regard and how minimal the direct association with children's TV advertisement exposure.

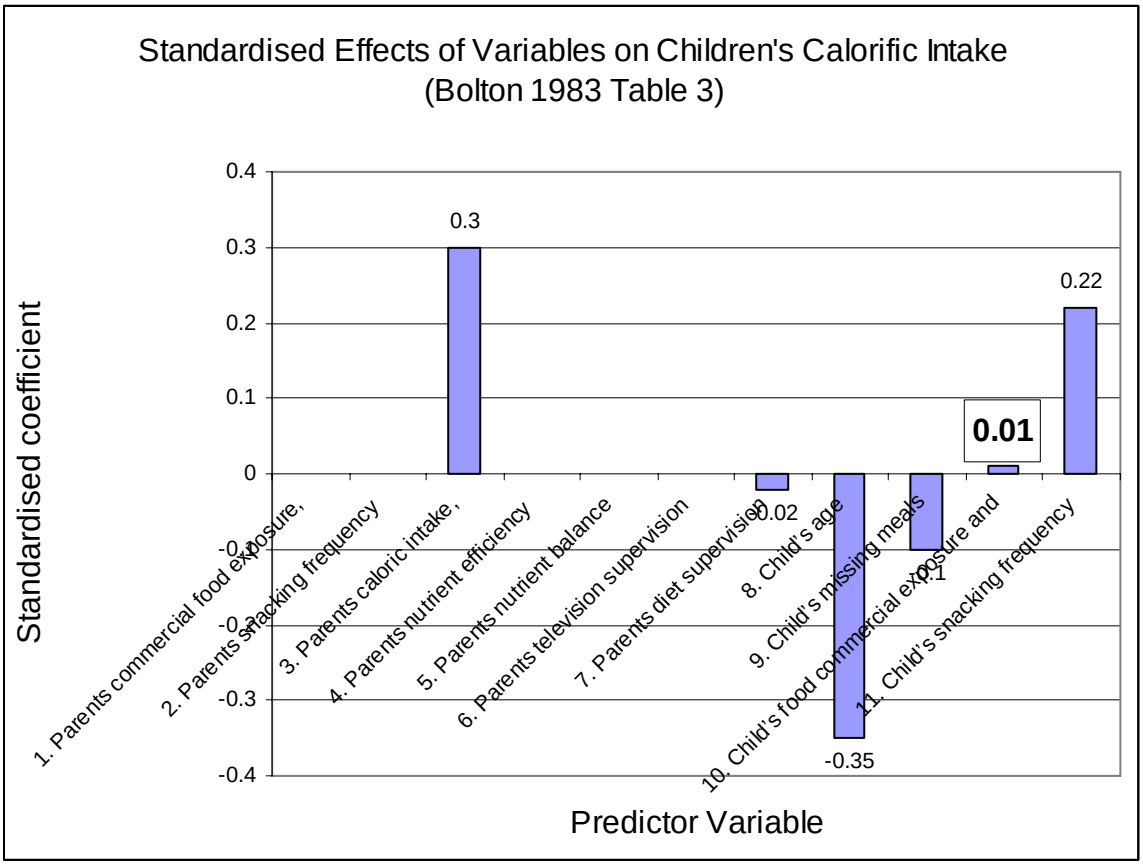


Figure 1 Standardised Effects of Variables on Children's Calorific Intake (data from Bolton 1983 Table 3)

There may be an indirect effect on calorific intake because children's snacking frequency is associated statistically with exposure to TV advertisements for HFSS foods. However,

although the Bolton evidence does show such an association, it is with a much lower scale of effect than parents snacking frequency, which appears the dominant predictive variable. **Figure 2** shows this.

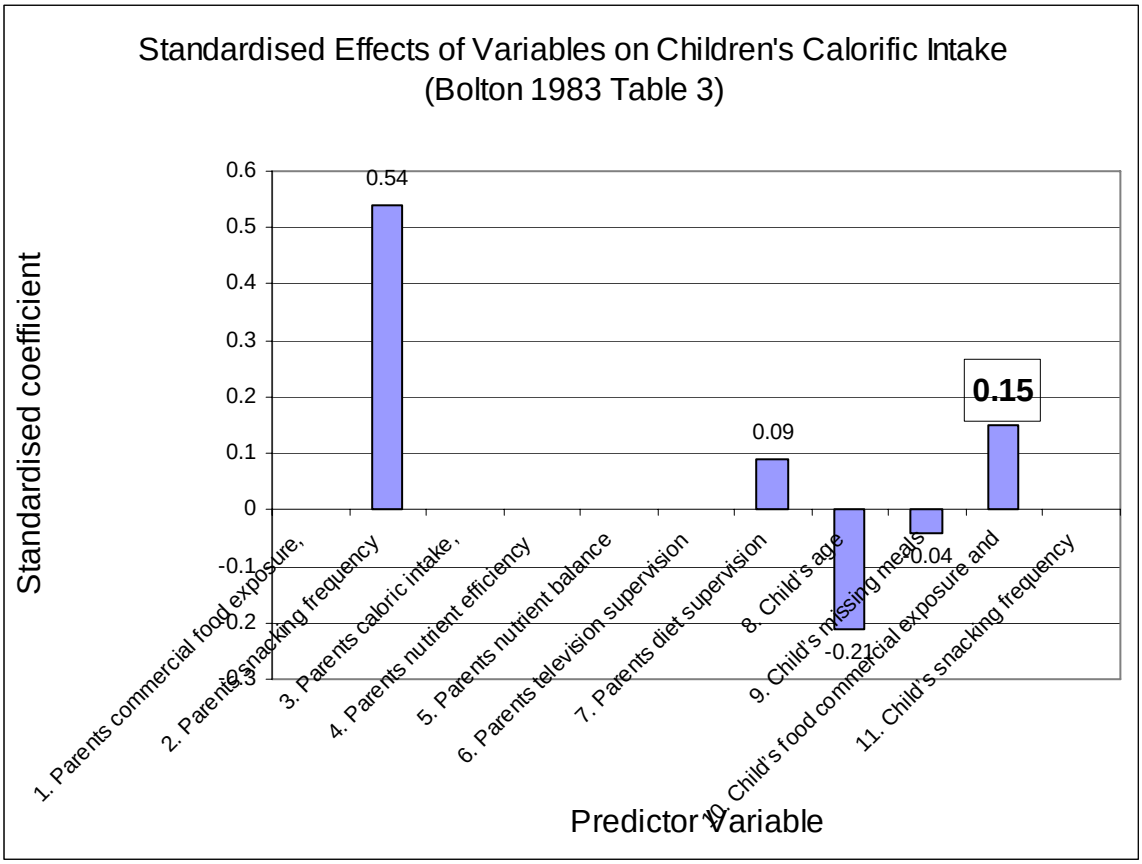


Figure 2 Standardised Effects of Variables on Children's Snacking Frequency (based on Bolton 1983 Table 3)

Ruth Bolton's conclusions are that children's food advertising exposure:

a) Increases the number of snacks (an extra 12 hours TV, including an extra 25 minutes direct exposure to food commercials would increase the number of snacks per <u>week</u> by … 1.
b) This snack is on average going to increase caloric intake by 1½ %.
c) "The resultant food commercial exposure has very small effects (in practical terms) on children's nutritional status. Since children in this study are typically well nourished, it is unlikely that effects of this magnitude could seriously affect their nutritional and physical wellbeing".
d) "Since the influence of television food advertising is very small, it is likely to be harmful only to those children who are not well nourished for other reasons."
e) "Government and public policy to improve children's nutritional status will be more effective if it focuses on the key determinants of children's diets…since parental diets – not television food advertising – seem to be a major influence."

It is also important to note that the Bolton research did not include variables for the act of watching TV itself and thus did not distinguish child's food commercial exposure. Other research has shown that watching TV per se (rather than the food adverts) is associated with obesity.

The equivocal nature of this evidence is not discussed in the Ofcom analysis.

Equally important, the opportunity to use any of the Bolton data is ignored.

Later in the Ofcom report (page 161), the analysis makes assumptions concerning the likely reduction in calorie intake if TV advertising for all HFSS foods were removed. The modelled Ofcom reduction for 11 to 15 year old boys is 239 calories a reduction of 12%. This is 8 times larger than the reduction suggested by Bolton's conclusions (see **Figure 2** below).

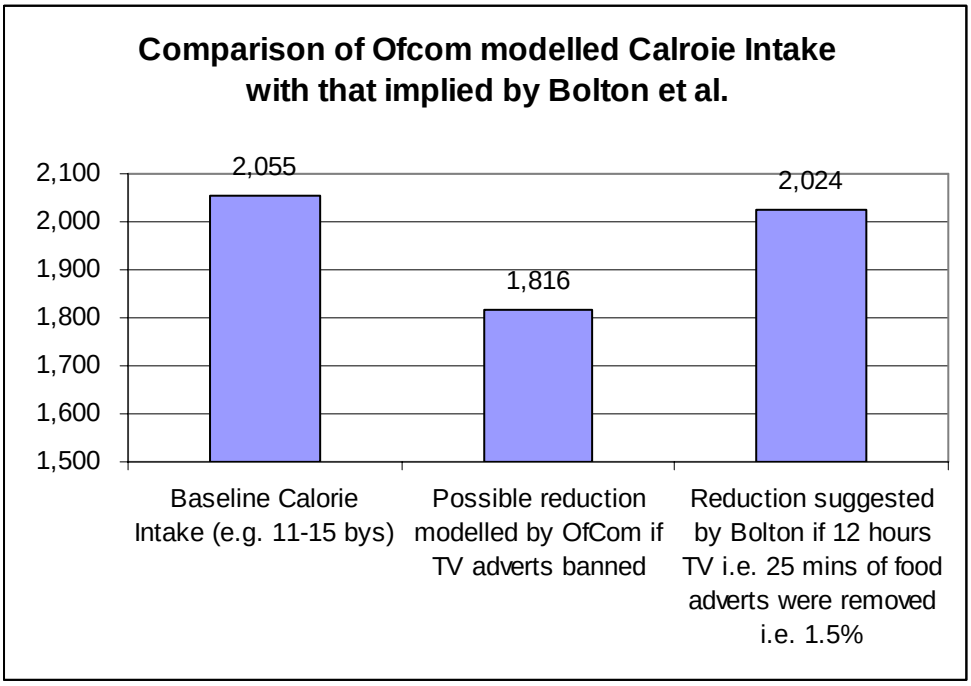


Figure 3 Comparison of Ofcom modelled Calorie Intake with that implied by Bolton et al.

Extrapolating the Bolton relationship, to achieve the calorie reduction suggested by the Ofcom report would require a reduction in each child's TV watching per week of 93 hours i.e. Children would need to reduce their TV watching from 55% of the waking and sleeping hours in a week down to zero.

This quick analysis suggests that the quantified results in the Bolton paper do not support the level of proposed reductions in Calorie intake in the Ofcom report

A final point is that the actual calorie requirement for 11-14 year old boys is 2220 kcals (COMA), so the question arises if these reductions were actually to take place would many children not be receiving sufficient energy especially during the puberty growth spurt?

Rebuttal:

The FDF response has not correctly understood the modelling undertaken by the FSA. As noted by the FSA its analysis attempts to be conservative at all points where appropriate, including its interpretation of Bolton (1983)'s work. Whilst for illustrative purposes the FSA

explain the calorie and general nutrient intakes that would occur should 100% of the substitutions modelled happen, throughout the benefits analysis it is made clear that this outcome is not envisaged and that a 10% level of substitution is the base case even given a total restriction of core category broadcast advertising to children. These 10% substitutions form the basis of the final monetised benefits presented along with the further reduction in policy effectiveness concerning the mapping of nutrient intake substitution into adulthood. These figures are then linearly adjusted by OFCOM analysts to account for the quantity of impacts their policy options would remove.

As such, it is incorrect to say that OFCOM/FSA have modelled weekly calorie reductions 8 times larger than Bolton (1983)'s composite 1.81% caloric intake effect as a child is exposed to a third increase in TV viewing.

FSA's base case of a 10% policy effect only constitutes a modelled 1.17% reduction in calorie intake for boys aged 11-15 and 1.26% for girls of that age (see Annex 5). It is again to be noted that this is assuming a complete restriction of child core category TV impacts, not just a third. As such this base case analysis represents a conservative interpretation of Bolton's results.

To further illustrate why we consider that this 10% base case policy success is realistic and conservative, if we assume a linear effect of broadcast exposure on child snacking in Bolton's work she would show an average of three less weekly snacking events per child given a total broadcast advertising restriction. We do not model the removal of any child eating episode, instead we suggest substituting more nutritious foods for core category ones. At the 10% base case we are in essence modelling only two of the child's weekly main meals (assuming three meals per day) as being substituted for relatively more nutritious ones given a total broadcast advertising restriction. Again we explain that we consider even these meal substitutions to be sensible and not unrealistically healthy.

To conclude, the FSA considers that its modelling of base case policy effects is consistent with a conservative interpretation of Bolton's work.

In terms of the FDF's argument that watching TV per se may be associated with obesity, FSA note that in their study, When Children Eat What They Watch: Impact of Television Viewing on Dietary Intake in Youth (2006), Wiecha et al[178] consider five US schools (548 children) near Boston. They find that each hour increase in television viewing was associated with an additional 167 kcal per day intake with this association "mediated by increasing consumption of calorie-dense low-nutrient foods frequently advertised on television."

Given the problem of growing child obesity in the UK at current calorie consumption levels, it is considered that the average modelled daily reduction of just 24 calories, at the 10% policy success base case (approximately 1% of intake), would not act to undermine sufficient energy intakes during the puberty period of early teenage boys.

[178]Wiecha, J.L., Peterson, K.E., Ludwig, D.S., Kim, J., Sobol, A., Gortmaker, S.L. When Children Eat What They Watch: Impact of Television Viewing on Dietary Intake in Youth. *Arch Pediatr Adolesc Med.* 2006;160: P436-442.

1.2 Grossman et al. and Its use in the Ofcom analysis

The main other evidence to quantify effects of TV advertising is from Grossman[177]. The analysis examines differential food advertising in 75 different US Designated Market Areas (counties with specific different local TV stations etc.). The effect of national level advertising is ignored – "network television, syndicated television, and cable network television advertising are not included in our data because they have no local variation."[177]

The analyses Grossman undertakes look at the statistical association between obesity and several "predictor variables". In fact, Grossman looks at two different measures of obesity:

A. Mean BMI

B. Probability of being overweight (defined as per footnote179)

For each of these quantified measures of obesity, statistical analysis looks at how "predictor variables" influence obesity. The predictor variables used are:

- **Message Seen** - the number of hours of spot television fast-food restaurant advertising messages seen per week
- **TV time watched** - the number of hours per week spent watching television
- Demographic variables for children or adolescents, including age, race, and gender
- Mother's employment status, household income, a dummy for missing income,
- Dummy variables indicating whether the mother is overweight (BMI of 25 kg/m2 or greater) or obese
- Per capita number of fast-food restaurants,
- Per capita number of full-service restaurants,
- The real cigarette price,
- Dichotomous indicators for clean indoor air laws,
- The real full-service restaurant price,
- The real food at home price,
- The real fast-food restaurant price
- Designated Market Area, (DMA)
- Year

Most importantly, two separate analyses are undertaken. Specification 1 includes both Message Seen and TV time watched. Specification 2 only includes Message Seen and specifically excludes TV time watched, meaning that any separate effects of these two different concepts are included into the single variable Message Seen in this 2nd specification. Several points are worth making from the results.

[179] An overweight child or adolescent (the term obese is reserved for adults) is defined as one having a BMI at or above the 95th percentile based on age- and gender specific growth charts for children and adolescents in the second and third National Health Examination Surveys (NHES II and NHES III), conducted between 1963 and 1965 and between 1966 and 1970, respectively, and from the first, second, and third National Health and Nutrition Examination Surveys (NHANES I, NHANES II, and NHANES III), conducted between 1971 and 1974, 1976 and 1980, and 1988 and 1994, respectively.

1. Results for children aged 3-11 and for adolescents aged 12-18 are shown to be different and there are significant differences between male and female slope coefficients in most specifications.

2. The results for specification 1 show some significant associations but mixed messages.
   a) For children aged 3-11, the 'messages seen' coefficient for boys is significantly associated with increased BMI (at the 10% level (0.1)) but the equivalent coefficient for girls is not significant.
   b) For children aged 12-18, the messages seen coefficient actually shows a negative tendency i.e. BMI is lower for those seeing more messages (!), but this is not statistically significant. However, the total TV time watched is significantly associated with increased BMI (particularly so for boys with a 1% significance level).
   c) Using the outcome "probability of overweight" the specification 1 results show no significant associations with either messages seen or TV time watched for any of the four age sex groups examined.

3. The results for specification 2 in which the total TV time variable is excluded from the analysis show clearer associations. It is unclear why this should be except that the two variables TV time watched and Messages seen are correlated. No separate results are given for a model, which excludes Messages Seen and only includes TV time watched. The explanatory power of the models (R^2) is similar in each case at around 0.10. (In statistics, the R^2 is the proportion of a sample variance of a response variable that is "explained" by the predictor variables when a linear regression is done). An R^2 of 0.1 means that 10% of the variations between people's obesity is able to be explained by the predictor variables examined and by implication that 90% of the variation is due to other causes not measured by the predictor variables used (e.g. the amount of exercise undertaken by the individuals or perhaps some genetic component affecting metabolic rate) or by random chance. For each age sex group the 'messages seen' coefficient is significantly associated with both increased BMI and increased probability of being overweight.

Grossman et al give a series of statements indicating the implied effect of changing advertisement exposure.

a) For specification 1 results for BMI: "Results suggest that increasing exposure to fast food advertising by a half hour per week (an approximate one standard deviation increase) will increase a boy's (aged 3-11) BMI by 0.30 kg/m2 (or 2 percent) and a girl's (aged 3-11) BMI by 0.12 kg/m2 (or 1 percent), respectively. On the contrary, the 'messages seen' variable is insignificant for adolescents i.e. no change in BMI would be predicted."

Acceptance:

The FSA accepts that it is balanced to include the insignificant result for adolescents to go alongside that for younger children.

b) For specification 1 results for probability of being overweight: the 'messages seen' variable is insignificant for all groups i.e. no change in the proportion of children overweight would be predicted.

c) For specification 1 results for BMI: "Our results suggest that increasing fast-food restaurant advertising messages seen by a half hour per week will increase both a boy's BMI and a girl's BMI by 0.16 kg/m2 (or roughly 1 percent). The same increase of exposure to fast food restaurant advertising will increase a teenage boy's BMI and a teenage girl's BMI by 0.49 kg/m2 (or 2 percent) and 0.37 kg/m2 (or 2 percent), respectively.

d) For specification 2 results for probability of being overweight: Our results indicate that increasing fast-food restaurant advertising messages seen by a half hour per week will increase the probability of being overweight by 1.6 percentage points (11 percent) and 1.1 percentage points (8 percent) for boys and girls aged 3-11, respectively. An equivalent increase in fast-food restaurant advertising messages seen for teenage males and females will increase their probabilities of being overweight by 3.2 percentage points (21 percent) and 0.6 percentage points (4 percent), respectively.

A third, more complex statistical specification is also used to analyse advertising exposure measured by the number of hours of messages aired in the respondent's Designated Market Areas. In this, Specification 3, "For children aged 3-11, the exposure variable has a positive effect on the body mass index and the probability of being overweight, but results are not statistically significant." The results are more significant for teenagers. And the possible impact assessment of changes is summarised as "These results suggest that increasing the messages aired in a respondent's DMA by an hour (approximately a one standard deviation increase) will increase a child's BMI by 0.04 kg/m2 (0.2 percent) and the probability of being overweight by 0.6 percentage points (4 percent). It will also increase teenage BMI by 0.09 kg/m2 (0.4 percent) and the probability of being overweight by 0.6 percentage points (4 percent)." These scale of impact assessments are of a much lower magnitude than those suggested by specification 2, indeed between 2 and 5 times smaller estimated effects.

The Ofcom report (p155) picks out only the quoted results for Specification 2, with no detailed discussion of the other non-significant or smaller scale specifications.

Rebuttal:

The inclusion of reference to this Grossman et al, post-Hastings and Livingstone empirical work, allows their meta-analysis to remain up-to-date. As does discussion of even newer survey and analysis included in the updated benefits assessment.

As explained, the FSA modelling was largely inspired by Bolton (1983)'s work and the more generalised views of Hastings and Livingstone. As noted the Grossman et al methodology differed to the dose response function and wider nutrient intake approach adopted by FSA. As such a fuller discussion of Grossman et al was not appropriate. FSA sought to accurately reflect the messages of the authors of Grossman et al as is again the case with the updated text from their paper's abstract now included in the benefits assessment:

"Our results indicate that a ban on these advertisements would reduce the number of overweight children ages 3-11 in a fixed population by 10 percent and would reduce the number of overweight adolescents ages 12-18 by 12 percent."

All of the Grossman analysis is based on a marginal analysis of fast food advertising only. There is no evidence concerning whether any effects might be higher or lower related to other advertising exposure e.g. confectionary, cereals etc.

Acceptance:

The FSA accepts this point and now drafts accordingly.

It should be note that Grossman records the mean hours watched per week is around 25 hours for children, 19 hours for adolescents. And the mean messages seen per week of fast food advertising is around 30 minutes for both (see **Table 1** below). As this is US based one might question how the US advertising set up differs from UK, e.g. are less or more food ads for HFSS foods shown and is the advertising more or less aggressive. With recent trends, a lot of UK adverts are already not shown to younger audiences. This sets in context the required 93 hours per week reduction required to achieve 239 calorie intake reduction based on our analysis of Bolton et al earlier in this document.

Variable	Definition	Ages 3-11 Mean (Standard Deviation)	Ages 12-18
TV Time (TV)	Time spent by child watching television	25.391 (25.529)	18.754 (14.547)
Messages seen	Hours of fast-food restaurant advertising messages seen per week in respondent's Designated Market Area (in hours per week)	0.529 (0.593)	0.432 (0.413)
Messages aired	Hours of fast-food restaurant advertising messages aired per week in respondent's Designated Market Area	3.507 (1.195)	3.809 (1.406)

Table 1 Grossman Measures of TV Watching Time and Messages Seen Based on US analyses

Again, we can do some crude analysis of the implied effects of the FSA 'what-if' scenarios versus the Grossman data. If Grossman results were able to be extrapolated to a situation with no advertising (i.e. the existing 30 minutes of messages seen are removed), then the reductions in mean BMI modelled would be as discussed above in (a) to (d) for Specification 1 and 2. This can be compared to the FSA 100% successful policy results as shown. Again, the scale of impact assumed by the FSA, for which no evidence is given, is much larger than can be evidence using the Grossman data.

Rebuttal:

As explained above, the FDF response has not correctly understood the modelling undertaken by the FSA. As noted by the FSA its analysis attempts to be conservative at all points where appropriate, including its interpretation of Bolton's work.

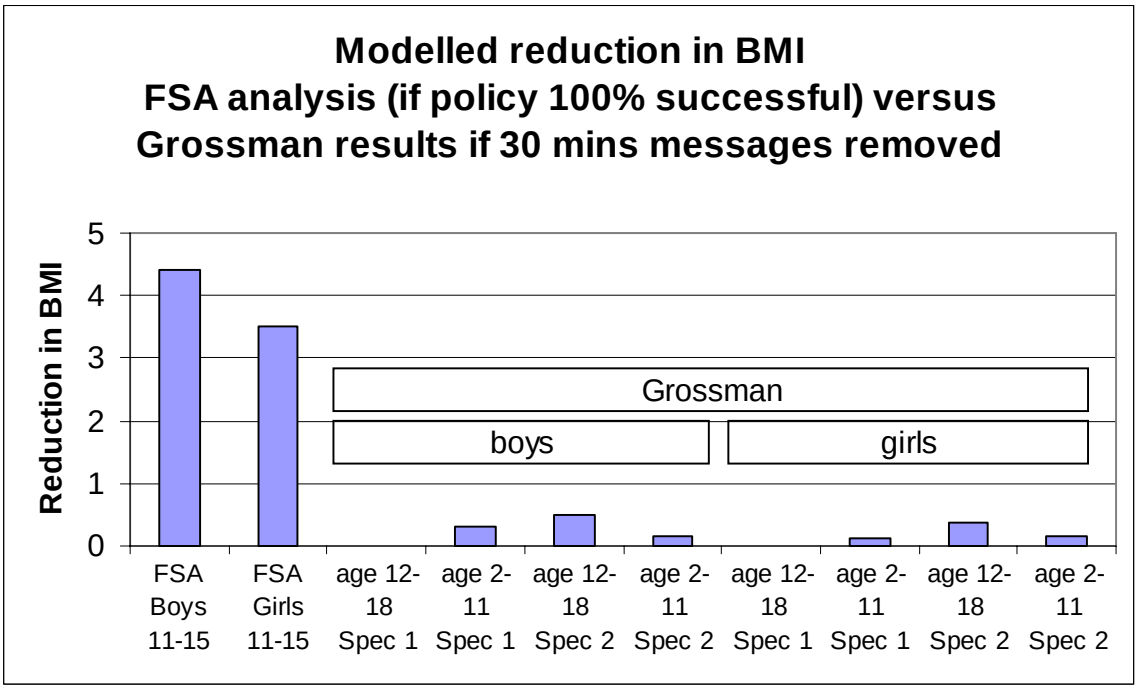


Figure 4 Modelled reduction in BMI - FSA analysis (if policy 100% successful) versus Grossman results if 30 minutes messages removed

Rebuttal:

As explained above, the FDF response has not correctly understood the modelling undertaken by the FSA. As noted by the FSA its analysis attempts to be conservative at all points where appropriate, including its interpretation of Bolton's work.

The base case (10% policy success) FSA reductions in BMI are 0.35 for 11-15 years boys and 0.44 for girls. This relates to a total TV advertising ban of children's core category impacts and not just the fast food restaurant spot messages studied by Grossman et al. Grossman et al.'s effects may have increased should they have also considered other broadcast advertising of core category foods.

Finally, Grossman picks out in particular mother's weight status variables as the most strongly associated variable with children's weight issues. This reflects the Bolton analysis (but with much less sensitivity since fewer explanatory variables are available to Grossman from his dataset), which showed that parental influences in the household have much larger associations with children's behaviour and calorie intake than TV advertisement exposure. Many fewer variables are included in the Grossman model than in the Bolton et al analyses. In particular, no parental effect variables are measured and so the indirect effects of these

parental factors, if they are correlated with TV advertising exposure would be mediated through this variable and potentially give greater weight in the statistical association analysis than is merited in a direct causative effect analysis.

Rebuttal:

As with Bolton's work, the association of parental weight variables with those of children are not pertinent to the range of policy options that OFCOM have been tasked with considering.

1.3 Other Related Evidence on TV Advertising and Weight, not analysed in the Ofcom Report - Quebec Evidence

The Ofcom analysis barely mentions the two important real life experiments. Ashton [180] quotes both of these studies saying "In Quebec, although food advertising [to children] has been banned since 1980, childhood obesity rates are no different to those from other provinces"[181] "A similar advertising ban has existed in Sweden for over a decade, but again this has not translated into reduced obesity rates." [182] A detailed discussion of practical and policy issues was recently published online in "Food Marketing to Children and Youth: Threat or Opportunity? (2006) Board on Children, Youth and Families"[183] These two cases are covered.

- The summary below is from "Food Marketing to Children and Youth: Threat or Opportunity? (2006) Board on Children, Youth and Families"
- "In Quebec, the Consumer Protection Act prohibits television advertising directed to children ages 13 and younger and has been in effect since 1980 (Hawkes, 2004; Quebec Government, 1980). The legislation only applies to commercial advertising, thus, educational advertising is allowed on television. In addition, the legislation cannot apply to signals originating from outside Quebec that are transmitted by cable television companies (Quebec Consumer Protection Act, 2005). Because of the television advertising ban, advertisers have changed commercials to make them less appealing to children. According to ASC, advertisements are more likely to be targeted to parents to urge them to purchase products for their children. Advertising dollars have also been diverted out of Quebec, thereby decreasing the amount of original French-language Quebec children's programming.
- "A study by Goldberg (1990) suggested that soon after its enactment in 1980, the Quebec ban served to reduce children's exposure to television commercials for sweetened breakfast cereals and consequently reduced children's consumption of these products. Even though children were still exposed to American commercials, only the English-speaking Canadian children could recognize and were more aware of products that were advertised, such as toys and sweetened breakfast cereals, and had more of these in their homes than did French-speaking Canadian children. The French-speaking children were also less likely to urge their parents to purchase these advertised products (Goldberg, 1990). On the other hand, a more recent study suggests that despite the advertising ban that has been in effect since 1980, television food commercials viewed by French-speaking Canadian children neither represent neither a balanced diet nor the foods recommended by the Canadian government (Lebel et al., 2005)."

[180] Ashton D. 2004. Food Advertising and Childhood Obesity. Journal of the Royal Society of Medicine 97: 51-2.

[181] Willms JD, Tremblay MS and Katzmarzyk PT. "Geographic and demographic variation in the prevalence of overweight Canadian children". Obesity Research 2003; 11:668-73

[182] Lobstein T, Frelut ML. Prevalence of overweight among children in Europe. Obes Rev 2003; 4: 195-200

[183] Food Marketing to Children and Youth: Threat or Opportunity? (2006) Board on Children, Youth and Families available at http://darwin.nap.edu/books/0309097134/html

- The reference given by Ashton analyses the changes in obesity prevalence among children across the different Canadian provinces (see Table 2). Quebec can be seen as a mid ranked prevalence state in 1981 (11.5% prevalence). By 1996 the prevalence of obesity among children had increased in Quebec to 27.6, an almost 3 fold increase (odds ratio reported as 2.94. The rate of increase in prevalence is not significantly different from the other provinces. Indeed Manitoba, Saskatchewan, Alberta and Ontario all have lower rates of increase.

Table 2. Variation among provinces in the prevalence of being overweight during childhood

					Comparisons with the rest of Canada			
			Change from 1981 to 96		Change from 1981 to 91		Prevalence 1996	
	Prevalence		Odds ratio	(95% Confidence interval)	Odds ratio	(95% Confidence interval)	Odds ratio	(95% Confidence interval)
	1981	1996						
Newfoundland	11.4	36.0	**4.38**	(2.68, 7.15)	1.34	(0.81, 2.20)	**1.40**	(1.13, 1.73)
Nova Scotia	12.9	35.0	**3.65**	(1.84, 7.24)	1.08	(0.54, 2.16)	**1.38**	(1.12, 1.69)
PEI	11.3	35.9	**4.39**	(2.59, 7.42)	1.42	(0.83, 2.45)	**1.40**	(1.03, 1.89)
New Brunswick	9.9	33.8	**4.64**	(2.81, 7.66)	1.50	(0.90, 2.52)	**1.26**	(1.01, 1.56)
Quebec	11.5	27.6	**2.94**	(2.11, 4.09)	0.88	(0.62, 1.27)	0.91	(0.78, 1.05)
Ontario	13.1	30.6	**2.93**	(2.32, 3.85)	0.88	(0.64, 1.20)	1.10	(0.97, 1.25)
Manitoba	18.2	24.6	1.47	(0.90, 2.39)	**0.43**	(0.26, 0.72)	**0.74**	(0.58, 0.93)
Saskatchewan	11.9	25.7	**2.56**	(1.61, 4.07)	0.77	(0.47, 1.24)	**0.78**	(0.64, 0.96)
Alberta	10.0	23.1	**2.72**	(1.71, 4.32)	0.84	(0.52, 1.35)	**0.68**	(0.56, 0.84)
British Columbia	5.1	26.6	**6.37**	(3.79, 10.72)	**1.93**	(1.14, 3.28)	0.95	(0.78, 1.16)
Canada	11.4	29.3	**3.24**	(2.83, 3.70)	–	–	–	–
Atlantic	11.1	35.3	**4.35**	(3.35, 5.66)	**1.48**	(1.09, 2.00)	**1.45**	(1.28, 1.65)
Prairies	12.6	24.4	**2.23**	(1.70, 2.92)	**0.62**	(0.45, 0.85)	**0.69**	(0.60, 0.78)

Please note that figures in bold text are statistically significant at $p < 0.05$.

Table 2: Reproduction of Table 2 from Willms et al. Canadian Analysis

Acceptance:

The inclusion of reference to both the Quebec and Swedish experiences following some restriction of core category advertising to children should be included in the benefits assessment.

As is noted by the FDF's reference, Goldberg concluded that the Quebec law (brought in in 1980) did appear to be influencing children's sweetened breakfast cereal consumption. Indeed the original work of Goldberg[184] reached the conclusion that: "The Quebec law served to reduce children's exposure to commercials for sugared cereals and hence appears to have reduced consumption of those cereals. There is no reason to believe that comparable legislation in the US would not have comparable results."

(Partial) Rebuttal:

[184] Goldberg, M.E. A quasi-experiment assessing the effectiveness of TV advertising directed to children. Journal of Marketing Research. 1990; XXVII, p445-54.

In terms of the evidence relating to the prevalence of childhood overweight in Canada, the comparison across Provinces provided by Willms et al.[185], whilst not being significant at the 5% level does report that between 1981 and 1991, the rate of increase of overweight in Quebec was lower than the Canadian average. An odds ratio of 0.88 is reported such that it is approximately 10% lower than the average rate of increase. However, this is not to suggest that any direct influence from the Quebec advertising law has been considered.

It is accepted that Ashton[186] considers the Willms et al. study to show that in Quebec: "although food advertising to children has been banned since 1980, childhood obesity rates are no different from those in other Canadian provinces."

In addition to concerns about overweight and obesity the FSA's economics modelling has stressed the importance of wider nutrient intakes and not simply calorie reduction, as such nutrient efficiency type measures would also help to assess the effects of advertising on children's intakes.

[185] Willms, J.D., Tremblay, M.S., Katzmarzyk, P.T. Geographic and Demographic Variation in the Prevalence of Overweight Canadian Children. Obesity Research, Vol. 11, No. 5. May 2003.
[186] Ashton, D. Food Advertising and Childhood Obesity. Journal of the Royal Society of Medicine 2004, Vol 97. No. 2. P51-2.

1.4 Swedish Evidence

"In Sweden, all television and radio advertising aimed at children ages 12 and younger during children's programming was banned in 1991 (Bjurstrom, 1994; Hawkes, 2004). The ban was enacted based on the view that children younger than 12 years cannot clearly distinguish advertising messages from program content, and on the principle that children should have the right to grow up in a commercial-free environment, especially young children who are trusting and do not understand the difference between information and the persuasive intent of advertisements or commercials (Bjurstrom, 1994). The ban is enforced by the National Consumer Ombudsman in Sweden and applies only to the Swedish commercial channel but not the Swedish channels broadcast from the United Kingdom (Hawkes, 2004; National Food Administration and National Institute of Public Health, 2005). A comprehensive evaluation was not available to assess the effectiveness of the ban on reducing exposure to child-directed television advertising."

The reference given by Ashton analyses obesity prevalence in countries across Europe. The maps below show that Swedish prevalence is not markedly different from elsewhere following the ban in 1991.

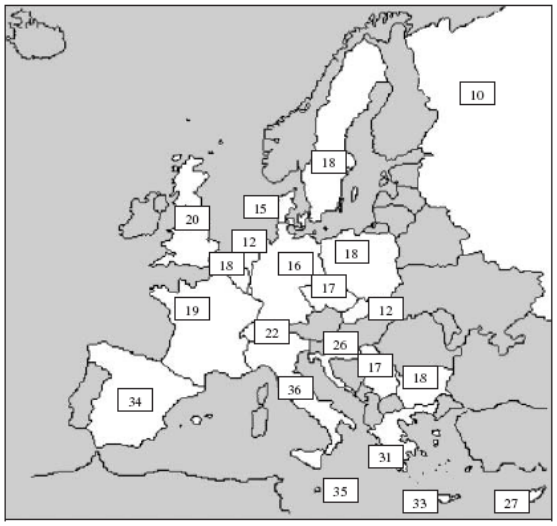


Figure 1 Prevalence (percentage) of overweight children aged around 7–11 years using the cut-off points recommended by International Obesity TaskForce (overweight includes obese).

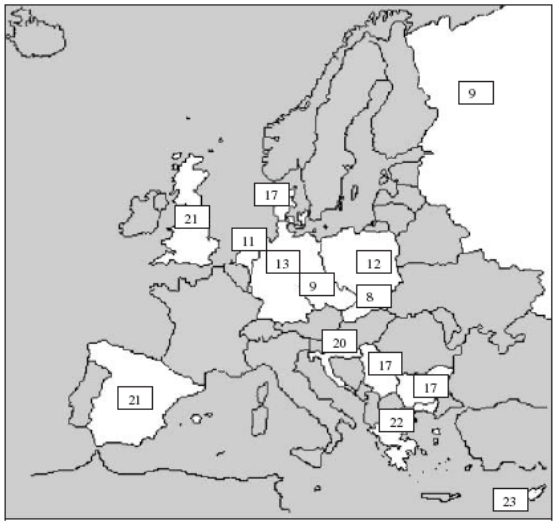


Figure 2 Prevalence (percentage) of overweight adolescents aged around 14–17 years using the cut-off points recommended by International Obesity TaskForce (overweight includes obese).

Figure 5 Swedish Prevalence of Childhood Obesity Compared with the rest of Europe from Lobstein et al.

(Partial) Rebuttal:

Ashton (2004) comments that: "A similar advertising ban has existed in Sweden for over a decade, but again this has not translated into reduced obesity rates." This seems based on the one salient statistic available from Lobstein and Frelut's[187] (2003) study, that in 2000-01 the percentage of overweight 9-11 year old Swedes was 18%. As the FDF note, this figure is not markedly different from those presented for other countries in Lobstein and Frelut. This is however a one-off country measure that does not allow consideration of history or other environmental factors including those of other European countries.

[187] Lobstein, T., Frelut, M.-L. Prevalence of overweight among children in Europe. The International Association for the Study of Obesity. Obesity Reviews 4, 2003. P 195-200.

1.5 Summary

1. The evidence is equivocal concerning whether there is a direct effect from children's advertising of food to obesity.

Rebuttal:
The FSA's benefits assessment relays the conclusions of Hastings and Livingstone.

2. Where some of the analyses do show an association, the effect is small in absolute terms and is much small than parental influence effects

Rebuttal:
The FSA considers that its modelling of a 10% base case policy effect is consistent with a conservative interpretation of Bolton's work.

Whilst Bolton/Grossman et al. find that parental caloric intakes and weight are associated with child outcomes, this point is not pertinent to the range of policy options that OFCOM have been tasked with considering.

3. Since the proposed policy change has no intended impact on parental influencing variables it is difficult to believe that significant effects on childhood obesity are likely to occur.
4. This is particularly the case since neither Quebec nor Sweden has seen successful reductions in childhood obesity after their advertising bans.

(Partial) Rebuttal:
In terms of the evidence relating to the prevalence of childhood overweight in Canada, the comparison across Provinces provided by Willms et al.[188], whilst not being significant at the 5% level does report that between 1981 and 1991, the rate of increase of overweight in Quebec was lower than the Canadian average. An odds ratio of 0.88 is reported such that it is approximately 10% lower than the average rate of increase. However, this is not to suggest that any direct influence from the Quebec advertising law has been considered.

It is accepted that Ashton[189] considers the Willms et al. study to show that in Quebec: "although food advertising to children has been banned since 1980, childhood obesity rates are no different from those in other Canadian provinces."

In addition to concerns about overweight and obesity the FSA's modelling has stressed the importance of wider nutrient intakes and not simply calorie reduction, as such nutrient efficiency type measures would also help to assess the effects of advertising on children's intakes.

[188] Willms, J.D., Tremblay, M.S., Katzmarzyk, P.T. Geographic and Demographic Variation in the Prevalence of Overweight Canadian Children. Obesity Research, Vol. 11, No. 5. May 2003.
[189] Ashton, D. Food Advertising and Childhood Obesity. Journal of the Royal Society of Medicine 2004, Vol 97. No. 2. P51-2.

2. The Food Substitution Model Used by FSA

2.1 Nutrient Profiling and the Expected Substitution of Foods Model from the FSA

Annex 2 of the document presents the food substitutions assumed to occur if TV advertising were to stop. The adjective "realistic" is applied to the food substitution model at one point in the report. It is important to question which aspect is realistic.

2.1.1 Is it realistic that food substitution occurs at all?

There is no evidence provided from behavioural research or elsewhere that it is realistic to assume that food substitution would occur at all.

Bolton is cited as evidence for reduced snacking frequency related to TV advertising reduction. This is true, although parental effects are much larger and it is evidence of very small levels of reduction in intake not substitution. There is some evidence in Bolton that the nutrient value of the food eaten declines if the child is exposed to more food commercials; but this is very small and not very significant ($p<0.1$).

Note also that Bolton did not clearly rule out that it could just be that kids snack in front of the TV, and this is independent of seeing adverts for those foods.

Rebuttal:

Bolton (1983) states that: "Third, children's exposure to television food advertising significantly decreases their nutrient efficiency, in addition to the indirect effect it has through increases in snacking frequency. …this implies that the child is substituting low-nutrient, high-calorie foods for previously consumed foods with equivalent calories but higher levels of nutrients. This is consistent with the notion that children's snack or meal food preferences are being influenced by the predominance of low-nutrient, high-calorie foods advertised on television."

With these results Bolton is saying that not only is the nutrient value of what children eat on average being reduced by increased snacking, but television food advertising is also acting to make children's diets less nutritious as they substitute towards low-nutrient foods even when not snacking.

This message from Bolton lends support to the FSA's approach to modelling dietary substitutions as core category broadcast food advertising is restricted.

As noted before, if we assume a linear effect of broadcast exposure on child snacking in Bolton she would show an average of three less weekly snacking events given a total restriction. Not only does the FSA's base case modelling of a total restriction yield calorie reductions lower than those pertaining to one less snacking event in Bolton's work, but we

also consider it conservative to not model the removal of any child eating episode and at 10% we are in essence modelling only two of the child's weekly main meals as being substituted for relatively more nutritious ones.

As explained in the benefits assessment, FSA/OFCOM acknowledge both the direct and indirect nutrient consumption effects related to broadcast advertising (as noted by Hastings and Livingstone). Given these and the work of Bolton (1983) we consider that a 10% policy success effect is both achievable and a realistic, if conservative, base case to be considered during this analysis.

2.1.2 Are the foods substituted realistic?

There is no evidence provided for the assumptions concerning what foods would be substituted. For instance, is it realistic that Kentucky Fried Chicken would be substituted with a low fat chicken sandwich or a chicken based ready meal in the absence of advertisements?

Rebuttal:

Clearly in an environment where such a policy has yet to be introduced it is not possible to provide robust evidence as to exactly how children's meal substitution may look ex post. As is explained the meals suggested as substitutes would be allowed to be advertised should the Nutrient Profile Model be employed and were suggested by FSA nutritionists as sensible but not unrealistically healthy.

2.1.3 Is the scale of substitution assumed realistic?

Most importantly, there is not any evidence provided that backs the assumption that the scale of food substitution suggested by FSA is realistic. This is the fundamental problem with the risk impact analysis.

No attempt is made to use the Bolton evidence or Grossman evidence on scale of effect. One possible route for analysis would be to examine the regression results data from Bolton (in her Table 3) which do show that nutrient efficiency (a composite measure of the nutrient value of the food intake) is very slightly influenced by TV advertising, although again parental factors by far outweigh this possible effect. As with other factors, the FSA work seems to assume an effect of an order of magnitude larger than would be justified based on the Bolton et al. evidence.

Rebuttal:

As noted before, if we assume a linear effect of broadcast exposure on child snacking in Bolton she would show an average of three less weekly snacking events given a total restriction on advertising to children. Not only does the FSA's base case modelling of a total

restriction yield calorie reductions less than one less Bolton snack, but we also consider it conservative to not model the removal of any child eating episode and at 10% we are in essence modelling only two of the child's weekly main meals as being substituted for relatively more nutritious ones.

As explained, the FSA modelling was largely inspired by Bolton (1983)'s work and the more generalised views of Hastings and Livingstone. As stated the Grossman et al methodology differed to the dose response function and wider nutrient intake approach adopted by FSA. The FSA considers that its modelling of base case policy effects is consistent with a conservative interpretation of Bolton's work.

2.1.4 The Scale of Anticipated Fruit Intake Increases Is the Key Driver for quantifying benefits and does not appear at all realistic

The majority of the benefits modelled are not due to reductions in obesity at all, they are due to increases in fruit intake as part of the assumed scenario of food substitution, which in turn lead to reduced cancer risk.

It is important to note the enormous scale of assumed fruit increase: Almost a threefold increase in fruit intake is assumed. Again no evidence is given to suggest that reductions in TV advertising will produce any increase in fruit intake let alone one of this magnitude

In addition it should be noted that there is plenty of evidence to suggest that even intensive recent campaigns to increase fruit and vegetable intake have failed to increase fruit intake by this sort of scale.

Even with 10% or the assumed minimum 5% policy effects (discussed in the next section) the underlying assumption is that removing TV advertising to children would produce a 30% or 15% increase respectively in daily fruit intake for children across the land on a permanent basis.

Table from p164/165

Age	4-6	7-10	7-10	11-15	11-15
Sex	All	Male	Female	Male	Female
Fruit Now	65.2	62.2	68.6	41.6	53.3
Fruit Future	151.1	170.6	167.0	155.0	156.9

Table 3 Assumed increases in fruit intake if TV advertising is banned

Rebuttal:

Horne et al.[190] conducted a London school intervention study that consisted of both peer modelling and rewards to increase exposure for fruit and vegetables. The peer modelling was via videos that featured hero figures who enjoy eating fruit and vegetables together with popstars and television presenters supporting the healthy eating message. The rewards included pencils and stickers for children who ate target amounts of fruit and vegetables. There were also "homepacks" aimed at encouraging further fruit and vegetable consumption at home as well as school. 749 children from ages 5 to 11 were studied from two schools, one acted as the control.

There were six peer modelling videos, each six minutes long. Whilst these are clearly longer than traditional television food adverts they do use the same visual medium of the television. As such the results of this study may be informative to the current analysis.

A sixteen day intervention period of rewards and encouragement letters from the food video heroes (and on at least 2 days out of 3 a video was shown) was then followed by a four-month maintenance phase. During which less frequent rewards were distributed and encouragement letters read out. In addition no videos were shown.

Compared with the baseline fruit and vegetable intakes the intervention period saw very large increases in consumption. Even after these declined somewhat, at the end of the four-month maintenance phase fruit consumption was 69% higher than its baseline in the experiment school and vegetable intake was 34% higher. In the control school the consumption of both had fallen below the baseline.

Horne et al. comment that: "The present study suggests that television can be used to positively influence children's diets." Whilst appreciating that this study concerned positive messages for fruit and vegetable consumption as opposed to restriction of core category food adverts and that the videos shown were of greater length than traditional television adverts, the FSA notes the considerable uplifts in intake that were achieved from baseline.

The FSA's base case of 10% policy effectiveness equates to approximately a 10g daily (or 18%) increase in fruit consumption. It is to be further noted that a half of this intake substitution is also assumed not to be mapped into adulthood at the monetisation stage.

[190] Horne, P.J., Tapper, K., Lowe, C.F., Hardman, C.A., Jackson, M.C. and Woolner, J. Increasing children's fruit and vegetable consumption: a peer-modelling and rewards-based intervention. European Journal of Clinical Nutrition (2004) 58, P1649-1660.

3. % Policy Effectiveness. The effect of reductions in TV advertising on food substitution -

3.1 No Evidence of effect, Assumptions of 10% and 5% effect but no definition

The single most important criticism of the Ofcom work concerns the assumptions concerning the policy effectiveness. The Department of Health analysis is undertaken assuming that 100% success is achieved in substituting foods. The FSA appear to acknowledge that this will not happen. An arbitrary 5% lower bound and 10% upper bound on policy effectiveness is assumed "to illustrate the effects". No evidence is given to support the choice of 5% or 10%. However, by the time we get to the economic and health impacts these are seen almost as upper and lower confidence intervals for a known effect within a range. By the time we get to the executive summary of the results only the 10% assumption results are presented.

There is no evidence presented to justify the choice of 5% or 10% policy effectiveness, nor why they might be considered upper or lower bounds. Equally feasible might be 4% or 3% or 2% or 1% or even 0%.

At a minimum one would expect to see systematic elicitation of expert judgement concerning the likelihood of policy success given the existing evidence. Better would be commissioned research to assess the scale of effect.

Furthermore, the assumption that the benefits obtained when 100% successful substation occurs would be able to be scaled pro rata if 5% or 10% policy success occurred is also not justified by the analysis.

There is no actual definition given for 10% or 5% policy success. Does it mean:

- 5% of the people will achieve the substitution scenario set out and stick to it for the long-term? Or
- 100% of the people will achieve just 5% of the substitutions – in which case significant changes in the proportion of obese children are unlikely? or
- 100% of the people will achieve the substitution but only 5% of the time dropping back to eating the original foods 95% of the time?

In each case, because the children who are obese will require substantial changes in behaviour to achieve non-obese status, the results could be different.

It is unclear whether the predicted effects of changes to TV advertising are quantified in terms of prevention of future possible obesity or in terms of reversal of existing childhood obesity. It is well evidenced that obesity is very hard to reverse, with a low success rate, and no discussion of this evidence is given.

Rebuttal:

Whilst for illustrative purposes the FSA explain the calorie and general nutrient intakes that would occur should 100% of the substitutions modelled happen, throughout the benefits

analysis it is made clear that this outcome is not envisaged and that a 10% level of substitution is the base case even given a total restriction of core category broadcast advertising to children. 5% is also reported as a sensitivity – upside sensitivities are not reported but would similarly be linear in nature. These 10% substitutions form the basis of the final monetised benefits presented along with the further reduction in policy effectiveness concerning the mapping of nutrient intake substitution into adulthood. These figures have been linearly adjusted by OFCOM analysts to account for the quantity of impacts their policy options would remove.

The FSA considers that its modelling of a 10% base case policy effect is consistent with a conservative interpretation of Bolton's work as explained before.

In terms of the assumed linear reduction in health benefits as policy effectiveness reduces from 100%. FSA considers that this is a pragmatic approach given the linearities that are outlined in Annex 5 and 7's treatment of each of salt, saturated fat, sugar/obesity and fruit.

Given the obvious information constraints re tracking individual diets through life, the base case is aimed at illustrating an average 10% dietary substitution across the child population. In other words, 10% of the modelled food substitutions (a 10% policy success) are achieved in the base case for each child, as they move into adulthood a 50% mapping of these substitutions is maintained.

The FSA/DoH modelling is based on the experiences of a birth cohort given broadcast restrictions. As such it can be characterised as prevention. That is not to say that today's excess/(under) salt, saturated fat, sugar and (fruit) consumption health outcomes will not also be significantly positively effected. The substantial length of temporal discounting of benefits makes the starting point for birth cohort benefit analysis a tangential point.

3.2 Summary Concerning Evidence of Effect

The key problem with the evidence for the intervention's effectiveness is the lack of any quantified direct causal evidence. Across the world, where advertising bans have been introduced they have not produced significant changes in childhood obesity.

The evidence provided for an effect comes from Bolton and Grossman, which are small-scale statistical associations rather than direct effects. Both authors recognise the equivocal evidence and both clearly signal that parental influence dominates.

Were this intervention a drug, it would not get a licence and it would not get NICE approval because the direct evidence of effect is not there.

The existing evidence is not used to quantify likely effects. Instead two arbitrary assumptions are made

1. The effect of banning food advertising will be to cause food substitution as described in the FSA scenario
2. The scale of the adoption of food substitution will be between 5% and 10%

There is no evidence presented at all concerning whether television advertising removal or reduction has any link to behaviour resulting in food substitution.

There is no evidence presented to quantify the scale of adoption, just arbitrary selection of 5% and 10% which begin as "what-if" scenarios and move on to become confidence intervals.

Rebuttal:

The FSA considers that its modelling of a 10% base case policy effect is consistent with a conservative interpretation of Bolton's work as explained before.

Bolton further notes that not only is the nutrient value of what children eat on average being reduced by increased snacking, but television food advertising is also acting to make children's diets less nutritious as they substitute towards low-nutrient foods even when not snacking.

4. Quantifying the health effects on Weight of Nutrient Profile Change using the Assumed Food Substitutions

Given the effect assumed effect of TV advertising on food substitution the analysis moves on to attempt to estimate the impact on health. In this section, the analysis of the impact on weight i.e. obesity is considered.

4.1 The Obesity Dose Response Function

Annex 4 details a dose response function, which relates weight to basal metabolic rate (BMR) and to physical activity.

Several comments are worth making on this approach.

The first problem with the application of this approach is that it assumes a "steady state". By steady state we mean that the model assumes that calorie intake is the same week in week out and that once TV advertising is removed calorie intake makes a step change downwards to a new constant level that is subsequently permanently sustained. The dose response model is then used to compute the weight at which there is a new equilibrium between energy intake and expenditure. One problem with this, is that many children who are obese are becoming increasingly obese i.e. they have still not achieved the steady state weight for their existing calorie intake and physical activity. A reduction in calorie intake for such children – were it to occur at all, might only slow the increase and find a new but still higher than existing steady state equilibrium weight. This issue is not considered in the dose response model.

The other key problem with the dose response function is that when it is applied in the analysis, the parameters are all given population average values. For example, the basal metabolic rate (BMR) is assumed to be a linear function of the individual child's weight (W) i.e. BMR = $\alpha + \beta W$, where α is a constant and β is the slope. When it is applied, the values for alpha and beta are assumed to be national average values. In reality, there will undoubtedly be individual variation in alpha and beta, meaning that for some children the assumed change in calorie intake will not reduce their weight as much as the average. The assumption that every child of say BMI 30 will reduce their weight by exactly the same amount will underestimate the numbers of children who remain overweight. It is also likely that obese people have a lower level of beta than the population average.

Similarly the physical activity level is assumed to be the population average physical activity (actually from 1991, which could well be out of date). Again it is almost certain that the physical activity level of those with childhood obesity is lower than that for the average. The latest figures for the PAR and PAL appear to be coming from 1991 data. It would seem possible that physical activity amongst children has changed since that time.

Physical activity levels are often cited as a more fundamental cause of childhood obesity e.g. Ashton says "there are reasons for regarding the current epidemic of childhood obesity as primarily a matter of energy expenditure rather than energy intake…. Today's children expend about 600k/cla per day less than their counterparts 50 years ago…" and provides

quantified evidence of the decrease in activity, increase in car dependency and sedentary lifestyle.

The most important issue in the dose response function model is that it can only be used to compute the average change in weight if everyone had the same calorie reduction. To realistically calculate the impact on the proportion of children who remain obese one would need to incorporate individual variability in calorie intake, basal metabolic rate and physical activity.

Rebuttal:

Assumption of steady state. The FDF points out that some of the children, particularly those at risk already have rising BMIs and are not in steady state. However, they are bound to reach steady state at some point. The reductions in calorie intake envisaged in the RIA will reduce the steady state BMI which they will eventually attain. The marginal impact of the policy on BMI is not greatly affected.

Use of population average values. As far as we are aware there is no data on the individual variation in the α and β parameters. With variation it is true that with the assumed calorie change some children will not reduce their weight as much as the average; but some will reduce their weight by more than the average. With obesity defined in terms of a threshold, using the average in this way will overestimate the proportion crossing the threshold. But the threshold is itself to some degree simply a convenient benchmark in a graded and continuous relationship.

There is no evidence that obese people have a lower β than the population average.

The point is made that the physical activity level of obese children is likely to lie below the population average value. The effect of this, however, is to increase the impact of calorie reduction on weight and enhance the effectiveness of a given reduction in calories. A lower β would have the same effect.

The causes of obesity. Obesity is a matter of the calorie balance. It doesn't matter whether it is exercising too little in relation to the calorie intake or overeating in relation to the level of exercise. Even if lack of activity is causing obesity, the balance can be restored by reducing intake as reliably as by increasing output.

In terms of the use of averages – this is the only practical way of conducting the analysis as we don't have the information to do otherwise.

4.2 Applying the Dose Response Function to the UK Population to quantify the effects on Weight of Nutrient Profile Change

The results of scenarios for food substitution are computed via the Nutrient Profile model. The baseline level of calorie and nutrient intake is taken from 1997 NDNS data. The food substitution model, as discussed earlier appears to be a scenario rather than an evidence based expectation of the effect of removing TV advertising to children.

The major assertion made is that if everyone taking in 239 calories fewer per day than the prevalence of childhood obesity would reduce by 60% for boys and 76% for girls. This is the absolute key to the quantification of benefits. Nowhere within the 175 pages is there a clear description of how the calculation to produce these figures is performed. The exact description given below is from page 161:

> "Given these reductions in calories, we can translate these into changes in BMI and subsequently changes in obesity and overweight prevalence (using the dose response function introduced earlier and average heights of children by age group)."

This is not transparent but is probably best interpreted as meaning that the computation undertaken took the following steps:

1. mean weight change is calculated for each age sex group using the dose response function (with the problems as discussed in 4.1), and then
2. the same mean weight reduction is assumed to apply to all children in the age group, and then
3. the mean BMI reduction is calculated by dividing the mean weight change by the mean height squared
4. and finally the distribution of BMI in each year age band i.e. 11-year-old bys, 12-year-old boys etc is shifted to the left by the mean BMI reduction.

Nowhere in the report are the baseline distributions for BMI in each age group given. Nor are the assumptions made clear as to how the distribution is assumed to shift following the policy introduction. The Health Survey for England does have data on this, and it can be seen that the distribution within each age band is skewed.

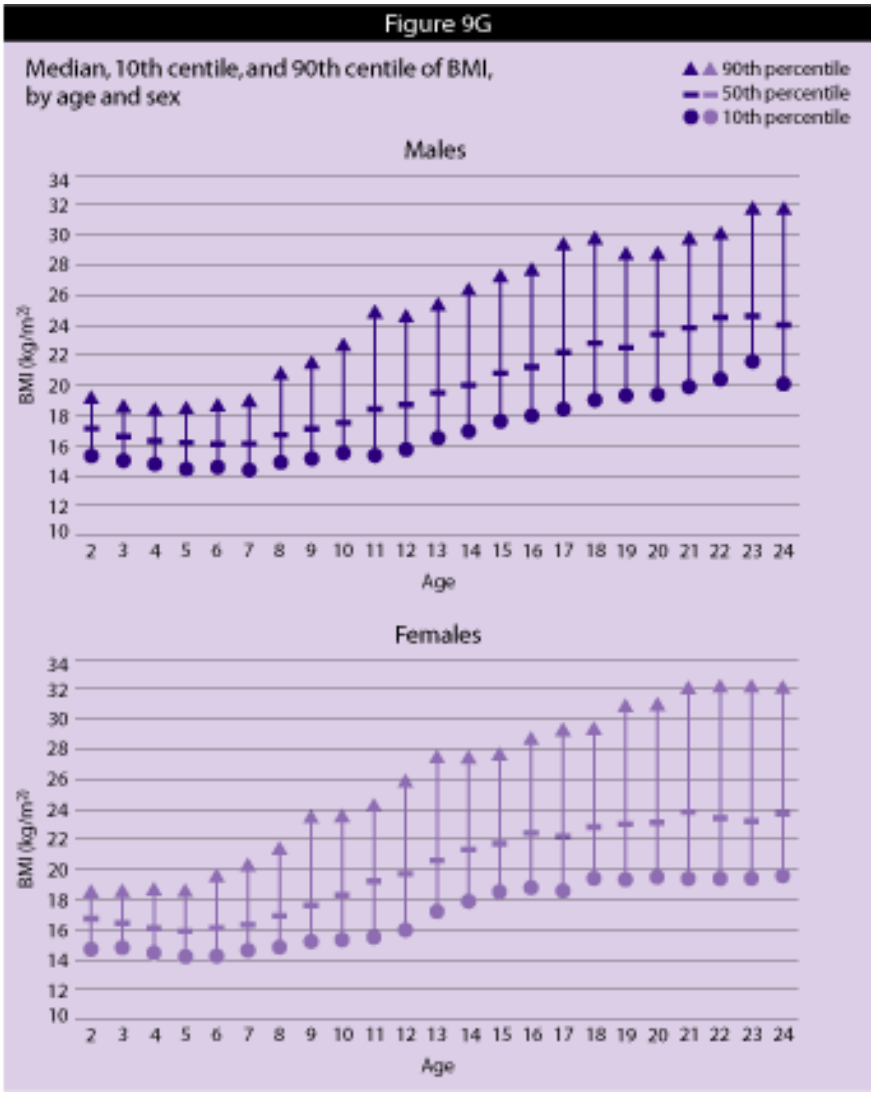


Figure 6 BMI by age taken from Health Survey for England http://www.archive2.official-documents.co.uk/document/deps/doh/survey02/hcyp/hcyp31.htm

•

Rebuttal:

The 239 calories figure only applies to boys, the outturn figure was 209 calories for girls.

These calculations feed into approximately a quarter of the final health benefits identified across nutrient groups, i.e. only those salient to obesity.

FSA considers that the description of how it obtained the modelled reductions in child obesity is straightforward. The FDF's 1-4 steps above are correct. The Health Survey for England is referenced.

As noted, the analysis was undertaken using the data from the HSE and as such at each age full account is taken of the BMI distribution. The BMI distributions are translated by the relevant BMI reduction and the salient reductions in child obesity obtained.

Also in this section of the Ofcom report, the article by Cutler et al [191] is quoted to give credence to the suggestion that "small" changes to calorie intake can have large effects on obesity prevalence. This representation and the quote from Cutler et al. are taken out of context. The Cutler analysis is simply a 'what-if' calculation (it says: if every American had increase calorie intake daily by 150 calories for the last 20 years that could explain the obesity rise) rather than a causative finding. In the same paragraph Cutler says, "These calorie numbers are strikingly small. 150 calories is 3 Oreo cookies or one can of Pepsi per day. It is about a mile and a half of walking. Given the small size of this change it is obviously difficult, if not impossible to determine exactly what explains it. The detailed data on dietary habits and activities that would be needed to examine this question do not exist." Cutler et al. cannot be used unequivocally as supportive evidence that small changes in mean calorie intake have caused the increases in US obesity rate. It is even less supportive of the concept that small *reductions* in mean calorie intake could cause reductions in obesity prevalence.

Acceptance:

FSA accept that the previous text could infer a causal finding. It has been changed accordingly.

Rebuttal:

Obesity is a matter of the calorie balance. It doesn't matter whether it is exercising too little in relation to the calorie intake or overeating in relation to the level of exercise. Even if exercising too little is causing obesity, the balance can be restored by reducing intake as reliably as by increasing output.

The FSA/DoH modelling is based on the experiences of a birth cohort given broadcast restrictions. As such it can be characterised as prevention. That is not to say that today's excess/(under) salt, saturated fat, sugar and (fruit) consumption health outcomes will not also be significantly positively effected.

[191] Cutler DM, Glaeser EL, Shapiro JM. Why have Americans become more obese? J Econ Perspectives 2003; 17:93-118.

A note on the Ratio of Obese adults Overweight as Children

Page 143 quotes 1997 evidence that 11% to 13% of adults were obese as children in the UK. It then quotes 1996 evidence that 57% of American obese adults were obese as children (such a large difference may be a question of definition?) The next statement simply assumes that the UK proportion is actually 25% i.e. an arbitrary doubling of the UK evidence because "it is considered … a realistic base case".

This has the effect of immediately and arbitrarily doubling the estimated reductions in adult obesity given the food substitution assumed to occur as a consequence of the policy.

Acceptance:

The FDF are correct, the US study quoted does indeed use a much less stringent measure of adiposity and is thus now removed from the text. The UK evidence is retained and a figure of 12% is now adopted.

5. Ofcom Methodology for Estimating the Impact on Mortality and Morbidity

The table on p146 presents deaths saved per unit change in nutrients – salt, saturated fat and sugar. Again the nutrient profile model is key to the health benefits. There are 4 dimensions

1. Lower salt reduces CHD and stroke 6050 deaths
2. Lower saturated fat reduces CHD risk 1550 deaths
3. Lower sugar reduces obesity and hence mortality 12000 deaths
4. More fruit reduces cancer deaths 31050 deaths

Annex 7 presents some detail on the calculations and computes the QALYs gained as a consequence of the various assumptions.

5.1 The effects of salt via blood pressure

For salt the assumptions translating the assumed permanent reduction by 0.9g of salt into health benefits seem appropriate.

5.2 The effects of saturated fat via cholesterol

For saturated fat the main issue would be that recent the large-scale introduction of statins in the UK would reduce these calculated benefits.

Rebuttal:

To the extent that successful new or future complementary government policies (or private personal) investments are made to improve the health outcomes associated with CVD, cancer and obesity (such as increased exercise, drugs and health screening), then through time the health benefits yielded by any given policy may require reassessment.

That said, when estimating the benefits of a proposed policy it is necessary to use the best available existing information/evidence as to the policy's potential impact.

5.3 The effects of sugar via obesity

For sugar, and hence obesity there seems to be some disconnect between the FSA and the Department of Health analysis. The DH calculations use two different mortality risk increases to apply to obesity, one based on an assumed figure of an extra 3.5 years of life to be achieved and a second set based on the NAO report. These give considerably different answers in terms of lives saved (table on p170); neither of which match those given in the FSA report on p147 and 151.

Rebuttal:

There is no disconnect. As noted the FSA use the more conservative of the two deaths averted estimates from Annex 7 – 10,500. As with the other lives saved analyses presented, this figure is based on an England birth cohort. As explained at page 146/7 the figures presented there have been uplifted to relate to the UK, thus 10,500 becomes 12,500.

5.4 The effects of fruit via cancer

It is the fruit and cancer risk computations, which give the most cause for concern. The large scale of fruit intake change discussed earlier is highlighted yet again here.

> "It appears then that 100 gm increase in daily fruit consumption would promote the consumer by two quintiles in terms of cancer risk." P 171

> "On these assumptions cancer mortality would fall by 24% in men and 14% in women." P 171

Such large-scale reductions in cancer mortality due to reducing TV advertising to children are effectively assuming

(a) that food substitution happens as described
(b) that it lasts as a permanent change for a life time in spite of all the factors known to influence food consumption, including taste and price, any parental influence and TV advertising in adulthood and
(c) that the associations seen in the EPIC-Norfolk study quoted carry through.

-

Certainly the first two assumptions lack a credible evidence base, and the third is an association rather than direct causative proof.

Rebuttal:

As noted before the 100gm fruit intake uplift related to 100% policy success – as is made clear, the reported base case not only relates to a 10% success, but also assumes only a 50% mapping ratio of nutrient intake substitution into adulthood.

The cancer analysis based on the EPIC-Norfolk study represents our best understanding of how to obtain such estimates of health benefits.

5.5 Four separate analyses of reductions in death but they are probably double counting and certainly not analysing competing risks

The analyses appear to be done independently which means that there is overestimation of the CHD death effects. The deaths prevented due to salt reduction are CHD and stroke, as are

those in the saturated fat analysis and presumably largely in the obesity analysis (though only partial details are given). It is unclear in the report but the likelihood is that there is some significant double or even triple counting in the reduced number of expected deaths. Similarly the gains due to fruit are related to cancer death reductions as presumably are at least some of the deaths prevented due to the other nutrients. Again there should be no double counting.

There does not appear to be any analysis of competing risks, i.e. it seems that the 4 analyses have been done separately. For example, once the salt impact has been calculated the correct thing to do would be to apply saturated fat reduction effects to a lower baseline risk.

It is also important to note that if fewer people really do die of CHD then more will have the chance to move on to develop cancer as a competing risk and also more chance of developing other expensive to treat illnesses such as Alzheimer's or renal disease, causing cost increases in health and social care.

Finally, the NHS is investing large sums of money in treatment and prevention of CHD and cancers. Given this the estimated risk reductions left after people's cholesterol becomes controlled using statins or colorectal cancers are prevented following the planned introduction of colorectal cancer screening will undoubtedly be smaller than those estimated here.

-

Rebuttal:

Double counting. There is some double counting but it is considered that the effects on the analysis are unlikely to be significant. To take an example. In round figures the RIA claims that salt averts 2000 CHD deaths, fat 1500. In 2004 there were about 87,000 CHD deaths in England. The risk reductions are 2.3% and 1.7%. If we combine these risks using the Mant-Hicks method, ie $1-\prod(1-p_i)$ *the risk reduction is not 4% but 3.98%. The number of deaths averted is 3466 instead of 3500. The extent of double counting is about 1%.*

In the RIA fruit averts only cancer deaths, so there is no double counting with salt and fat. Indeed you could argue that there is undercounting as the salt and fat effects leave more lives available to be saved from cancer by fruit.

Competing risk. This is inherent in all estimates of lives saved, for example, the widely accepted estimates of the deaths caused by smoking, those which could be averted if no one had ever smoked. Smokers would have died anyway of something so the tobacco related deaths are not really saved merely postponed.

To the extent that successful new or future complementary government policies (or private personal) investments are made to improve the health outcomes associated with CVD, cancer and obesity (such as increased exercise, drugs and health screening), then through time the health benefits yielded by any given policy may require reassessment. That said, when estimating the benefits of a proposed policy it is necessary to use the best available existing information/evidence as to the policy's potential impact.

5.6 Incompatibility of Results with Other Evidence

Incidentally, Grossman quotes Flegal et al. (2005) reporting approximately 112,000 excess deaths in the year 2000 due to obesity in the US. Given that the UK population is around 1/3 the numbers and with lower obesity rates does it seem plausible even that the 100% successful version of the policy would in fact achieve anything like the estimated 51000 deaths per annum averted quoted on page 152

Rebuttal:

Incompatibility of results with other evidence. As clearly explained, the RIA states that a quarter or less of the 51,000 deaths are due to reduced obesity. The others are due to dietary changes not mediated by obesity. For example, the analysis of the effect of fat assumed isocaloric change, so the RIA analysis actually abstracted from the effect on obesity.

6. Turning Health Benefits into Monetised Benefits and Considering Costs to the NHS and Society

6.1 QALYs versus Value of a Life

The mortality and morbidity estimates reviewed earlier are transformed into monetary terms using 2 different methods.

In general the QALY methodology has more credibility in health economic decision-making than the value of a statistical life approach. NICE guidance favours the QALY approach, as do other reimbursement agencies internationally. It is particularly important in this case, since the life being "saved" (i.e. lengthened) is for relatively elderly people who are avoiding cancer, CHD and stroke etc., diseases that typically occur late in life. Thus the lengthening of life, which might actually occur, is much lower than that for example of a younger aged man who avoids a fatal road accident. This means that the QALY approach rightly would account for two facts (a) that the lengthening of life would be lower than average and (b) that it occurs in an age group, which suffers from other illness and hence less than perfect health. The presented results reflect these large differences with the QALY approach correctly showing much lower benefits than the value of a life approach:

UK Annual Monetised Health Benefits; VOL	100% mapping of nutrient intake substitution into adulthood	50% mapping of nutrient intake substitution into adulthood	25% mapping of nutrient intake substitution into adulthood
Undiscounted	£7,990m	£3,995m	£2,000m
NPV discounted 50-years: mortality and morbidity	£1,575m	£790m	£395m
NPV discounted 60-years mortality; 50-years morbidity	£1,210m	**£605m**	£300m

UK Annual Monetised Health Benefits; QALYs	100% mapping of nutrient intake substitution into adulthood	50% mapping of nutrient intake substitution into adulthood	25% mapping of nutrient intake substitution into adulthood
Undiscounted	£1,640m	£820m	£410m
NPV discounted 60-years mortality; 50-years morbidity	£250m	**£125m**	£65m

VOL: statistical value of a life
QALY: quality adjusted life years. (Quality of life is measured on a scale with perfect health = 1 and death = 0. A person living in perfect health for one year has gained a QALY).
NPV: Net present value. NPV is a standard method used in finance when planning of long-term investments. It calculates the present value of cash inflows (in this case monetized benefits) minus the present value of all cash outflows. A key input into this process is the "discount rate" which is used to discount future cash flows to their present values.

Comment:

Whilst largely accepting the comments of the FDF above – that in general the QALY methodology may have more credibility in the current context. The FSA does not consider it appropriate to finally conclude that the traditional use of QALYs is the correct monetising tool here. A key reason for this being the growing understanding of researchers that in empirical WTP studies most people exhibit a "pure value of living" per se which is not trivial. As using traditional money values for QALYs will fail to capture this effect, the FSA considers it best to report both the QALY and WPT/VOL monetised figures as a range within which the true value is expected to lie.

The importance of the pure value of living element of such analysis has been raised by Professor Michael Jones-Lee of the University of Newcastle upon Tyne Business School. In explaining his and colleagues' research relating to WTP analysis he has told the FSA that:

"It seems pretty clear both intuitively and from the empirical evidence that some sort of pure value of living exists for most people. So, to ignore it completely and treat the extension of a sick 80 year old's life by, say, two years as being only "worth" two times the value of a QALY (e.g. about 2 x £30,000 = £60,000) just seems to me to be misguided."

6.2 Only 10% policy effect results shown

The only monetised results presented (p150 and p152) assume a 10% policy effect to be achievable. No reason is given as to why. If a 5% policy success were achieved then the results would halve.

Rebuttal:

It is stated that we believe the 10% policy effectiveness to be achievable and thus it is presented as the base case – sensitivities around this percentage are linear as is stated throughout the document (with 5% and 100% figures being often quoted as results as the analysis within the model builds).

6.3 Arbitrary Assumption for mapping through to adulthood

The "basecase" results given here suddenly assume that only 50% of the nutrient changes that occur in childhood transfer through to adulthood and therefore the results can be reduced pro rata. Again, the definition of this 50% "mapping" through is vague. It might be 50% of people having no persistence in food substitution or 100% of people having only half of their food substitution maintained. There is no evidence presented as to why the proportion chosen should be 50% rather than 40% or 30% or 20% or 10%.

Rebuttal:

1. *As is noted, having explained what evidence exists tracking childhood consumption of the wider nutrient categories through time and coupled with a 70% figure of adolescent obesity tracking into adulthood. We consider that using a 50% mapping ratio into adulthood of the nutrient intake substitutions yielded at any level of policy success to be a sensible base case. Sensitivities are provided at 25% and 100%.*

Given the obvious information constrains re tracking individual diets through life, the 50% base case is aimed at giving an average estimate of the monetised outcomes should approximately 50% of the intake substitutions maintain in adulthood; with reductions coming either/both from complete reversal of substitution for some people and partial reversal for others.

6.4 Benefits under other "realistic assumptions"

There are no reasons given for selecting 10% as the policy effectiveness that could be expected, nor for choosing 50% for the mapping through from childhood to adulthood of the nutrient changes suggested, nor for the choice of 25% for the % of adults who were obese as a child. To see how important these assumptions are, a series of less optimistic assumptions are made below to quantify the effects. There appears no reason to conclude that the results presented below are less realistic than those assumptions used in the Ofcom base case. Indeed for some of them the likelihood is that they are more realistic. Other just as realistic assumptions are able to be made. These include

- the mapping of nutrient changes into adulthood (assumed 50% in the basecase which might equally be 25% or 10% or even lower)
- the % Policy Success, (assumed 10% in the basecase which might equally be 5% or 4% or…)
- The % of adults who were obese as a child (assumed 25% in the basecase but UK evidence suggests 11% to 13%

Assumption Used			RESULTS	
Mapping into adulthood	% Policy Success	Assumed % of adults who were obese as a child	Value of Life Benefits (£millions)	QALY Benefits (£millions)
FSA Base Case				
50%	10%	25%	£ 605	£ 125
Alternative Scenarios				
50%	5%	25%	£ 303	£ 63
50%	4%	25%	£ 242	£ 50
50%	3%	25%	£ 182	£ 38
50%	2%	25%	£ 121	£ 25
50%	1%	25%	£ 61	£ 13
50%	0%	25%	£ -	£ -
25%	10%	25%	£ 303	£ 63
25%	5%	25%	£ 151	£ 31
25%	4%	25%	£ 121	£ 25
25%	3%	25%	£ 91	£ 19
25%	2%	25%	£ 61	£ 13
25%	1%	25%	£ 30	£ 6
25%	0%	25%	£ -	£ -
25%	10%	12.5%	£ 151	£ 31
25%	5%	12.5%	£ 76	£ 16
25%	4%	12.5%	£ 61	£ 13
25%	3%	12.5%	£ 45	£ 9
25%	2%	12.5%	£ 30	£ 6
25%	1%	12.5%	£ 15	£ 3
25%	0%	12.5%	£ -	£ -
10%	10%	12.5%	£ 61	£ 13
10%	5%	12.5%	£ 30	£ 6

10%	4%	12.5%	£	24	£	5
10%	3%	12.5%	£	18	£	4
10%	2%	12.5%	£	12	£	3
10%	1%	12.5%	£	6	£	1
10%	0%	12.5%	£	-	£	-

- **Table 4: Benefits under alternative realistic assumptions**

This shows clearly that much smaller, and down to almost zero benefits might occur if different assumptions were used.

Rebuttal:

The reasons why the FSA consider the use of 10% policy success and 50% nutrient intake mapping as the base case has already been explained.

The FSA has also already explained that it accepts that a change in the 25% of obese adults having been obese children figure is appropriate. However, the FDF have misunderstood the relevance of this figure's use in the FSA analysis.

It has no impact on the final WTP/VOL or QALY monetised benefits. The only effect that this figure has is in relation to the proportion of the NAO/HoCHC identified obesity costs that may be prevented – this is presented for illustrative purposes only. As is explained the FSA/DoH methodology to seek understanding of the health impacts of wider nutrient substitution does not at all rely on the NAO/HoCHC study.

As such the inclusion of the obese adults having been obese children figure in the FDF's table above is a misunderstanding of the FSA analysis.

7. Some Final Comments on Ofcom Analysis of Alternative Policy Options

7.1 Comments on the Policy Analysis

The policy options analysed are

Do Nothing
Package 1: Timing restrictions on food and drink deemed high in salt' fat and sugar according to the FSA profiling model
Package 2: Timing restrictions on all food and drink products
Package 3: Volume-based restrictions on all food and drink products

The benefits analysed in the FSA Research document and discussed hitherto are assumed to apply to Package 1.

Package 2 would ban all food advertising. Ofcom consider this to have similar costs but lower benefits because the ban would include a ban on adverts for healthy foods. No detailed analysis is undertaken

Package 3 has almost identical benefits, but has adjustments as described in the paragraph below. There is no detail given for the analysis of package 3 other than that below.

> "In addition, the volume restriction element of this package would apply to just under a third of all impacts. Ofcom has estimated that this would equate to just over 50% of children's impacts. Were the range of values to broadcasters of HFSS and non- HFSS adverts to be very similar, then this would lead to benefits of about of around £333m pa (VOL) and £69m pa (QALY) including the benefits of the pre-school programming ban. However, broadcasters are likely to react to a volume restriction by removing those adverts, which generate the least value to them first. In the worst case assuming that broadcasters removed all non-HFSS adverts before removing any HFSS adverts in response to the volume restriction, this would equate to around 45% of children's impacts being affected and the (lower bound) on the benefits would be around £285m pa (VOL) and £59m pa (QALY). A reasonable but still prudent estimate of the benefits that might accrue would be halfway between this lower bound and the average estimate i.e. around £309m pa (VOL) and £64m pa (QALY)."

In section's 1 to 6 of this report, one must conclude that the results prepared by Ofcom of the likely scale of impact of Package 1 are neither reasonable nor prudent and the same must be concluded for Packages 2 and 3.

Rebuttal:

On the contrary, the FSA is of the opinion that the benefits analyses that it and DoH have undertaken are reasonable, prudent and conservative. The FDF's misunderstanding of the analysis is likely to have led it believe otherwise.

7.2 What-if other "realistic" assumptions were made.

The implication of the analysis presented by Ofcom is that package 1 represents the best value for money and is always economically attractive versus do nothing.

However, this is based upon the assumptions of the basecase. If these assumptions are widened to alternative scenarios as used **Table 4**, it can be seen that the benefits to society could also be substantially lower (column a). Furthermore the costs (albeit to advertisers not government) could outweigh the benefits (column c) meaning that the overall net effect could be net detrimental

Mapping into adulthood	% Policy Success	Assumed % of adults who were obese as a child	Benefits (£millions) QALY Based (a)	Cost of Package 1 (b)	Net benefit to Society (c) =(a) – (b)
			• £125		
50%	10%	25%		£ 28	£97
50%	5%	25%	£ 63	£ 28	£35
50%	4%	25%	£ 50	£ 28	£22
50%	3%	25%	£ 38	£ 28	£10
50%	2%	25%	£ 25	£ 28	-£3
50%	1%	25%	£ 13	£ 28	-£15
50%	0%	25%	£ -	£ 28	-£28
25%	10%	25%	£ 63	£ 28	£35
25%	5%	25%	£ 31	£ 28	£3
25%	4%	25%	£ 25	£ 28	-£3
25%	3%	25%	£ 19	£ 28	-£9
25%	2%	25%	£ 13	£ 28	-£15
25%	1%	25%	£ 6	£ 28	-£22
25%	0%	25%	£ -	£ 28	-£28
25%	10%	12.5%	£ 31	£ 28	£3
25%	5%	12.5%	£ 16	£ 28	-£12
25%	4%	12.5%	£ 13	£ 28	-£15
25%	3%	12.5%	£ 9	£ 28	-£19
25%	2%	12.5%	£ 6	£ 28	-£22
25%	1%	12.5%	£ 3	£ 28	-£25
25%	0%	12.5%	£ -	£ 28	-£28
10%	10%	12.5%	£ 13	£ 28	-£15
10%	5%	12.5%	£ 6	£ 28	-£22
10%	4%	12.5%	£ 5	£ 28	-£23
10%	3%	12.5%	£ 4	£ 28	-£24
10%	2%	12.5%	£ 3	£ 28	-£25
10%	1%	12.5%	£ 1	£ 28	-£27
10%	0%	12.5%	£ -	£ 28	-£28

Rebuttal:

The reasons why the FSA consider the use of 10% policy success and 50% nutrient intake mapping as the base case has already been explained.

The inclusion of the obese adults having been obese children figure in the FDF's table above is a misunderstanding of the FSA analysis.

IA Annex C

FSA Response to A. Jefferson's Comments

FSA Response to the Comments of Angie Jefferson Regarding the FSA Benefits Analysis

In terms of the FSA's modelling of children's diets substituting core category foods for more nutritious ones, including fruit, we note the work of Bolton and that of Horne et al. (as noted by Angie Jefferson).

Bolton (1983)[192] states that: "Third, children's exposure to television food advertising significantly decreases their nutrient efficiency, in addition to the indirect effect it has through increases in snacking frequency. …this implies that the child is substituting low-nutrient, high-calorie foods for previously consumed foods with equivalent calories but higher levels of nutrients. This is consistent with the notion that children's snack or meal food preferences are being influenced by the predominance of low-nutrient, high-calorie foods advertised on television."

With these results Bolton is saying that not only is the nutrient value of what children eat on average being reduced by increased snacking, but television food advertising is also acting to make children's diets less nutritious as they substitute towards low-nutrient foods even when not snacking.

This message from Bolton lends support to the FSA's approach to modelling dietary substitutions as core category broadcast food advertising is restricted.

[192] Bolton, R. N., (1983). Modeling the Impact of Television Food Advertising on Children's Diets. Current Issues and Research in Advertising 1983.

Horne et al.[193] conducted a London school intervention study that consisted of both peer modelling and rewards to increase exposure for fruit and vegetables. The peer modelling was via videos that featured hero figures who enjoy eating fruit and vegetables together with popstars and television presenters supporting the healthy eating message. The rewards included pencils and stickers for children who ate target amounts of fruit and vegetables. There were also "homepacks" aimed at encouraging further fruit and vegetable consumption at home as well as school. 749 children from ages 5 to 11 were studied from two schools, one acted as the control.

A sixteen day intervention period of rewards and encouragement letters from the food video heroes (and on at least 2 days out of 3 a video was shown) was then followed by a four-month maintenance phase. During which less frequent rewards were distributed and encouragement letters read out. In addition no videos were shown.

Compared with the baseline fruit and vegetable intakes the intervention period saw very large increases in consumption. Even after these declined somewhat, at the end of the four-month maintenance phase fruit consumption was 69% higher than its baseline in the experiment school and vegetable intake was 34% higher. In the control school the consumption of both had fallen below the baseline.

Horne et al. comment that: "The present study suggests that television can be used to positively influence children's diets." Whilst appreciating that this study concerned positive messages for fruit and vegetable consumption as opposed to restriction of core category food adverts and that the videos shown were of greater length than traditional television adverts, the FSA notes the considerable uplifts in intake that were achieved from baseline.

The FSA's base case of 10% policy effectiveness equates to approximately a 10g daily increase in fruit consumption. It is to be further noted that a half of this intake substitution is also assumed not to be mapped into adulthood at the monetisation stage. The extent to which other factors may act to improve adult diets may complement the effects of restricting broadcast advertising of core category foods to children.

To the extent that product reformulation is encouraged in order for food products to continue to be allowed to appear in broadcast advertising to children, there may be two nutritional intake effects.

Firstly, as note by Angie Jefferson, if the modelled FSA substitutions are replaced by ones that result in switching to nutrient profile compliant foods that are reformulated but that are less nutritious than the original envisaged substitutions then the health benefits would on this hand be reduced. However, on the other hand, as the FSA base case only envisages a couple of weekly meal substitutions, the systematic nutrient improvement of industry recipes, ingredients etc would be likely to have big dietary health impacts across a big number of meal times where the FSA base case is in essence not considering substitution. It is expected that such reformulations would be the dominant factor, thus increasing benefits.

[193] Horne, P.J., Tapper, K., Lowe, C.F., Hardman, C.A., Jackson, M.C. and Woolner, J. Increasing children's fruit and vegetable consumption: a peer-modelling and rewards-based intervention. European Journal of Clinical Nutrition (2004) 58, P1649-1660.

The extent to which adults buy confectionery for children such that it is the adult making the purchase decision, does not really take into account the pester power that the adult is under at point of purchase nor does it capture the potential for the child to make the consumption decision post-purchase having been influenced at that stage by broadcast advertising of core category foods.