



REVIEW OF RESEARCH ON THE EFFECTS OF FOOD PROMOTION TO CHILDREN

Final Report

Prepared for the Food Standards Agency

*Gerard Hastings, Martine Stead, Laura McDermott,
Alasdair Forsyth, Anne Marie MacKintosh, Mike Rayner,
Christine Godfrey, Martin Caraher and Kathryn Angus*

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CONTENTS

	<u>Page No</u>
LIST OF ABBREVIATIONS	vi
LAY SUMMARY: Does Food Promotion Influence Children? A Systematic Review Of The Evidence	1
MANAGEMENT SUMMARY	4
INTRODUCTION	22
PART 1: NARRATIVE REVIEWS	26
Introduction to Narrative Reviews	27
Narrative Review 1: Marketing, Promotion and Consumer Behaviour	28
Narrative Review 2: The Promotion of Tobacco and Alcohol to Young People	40
PART 2: SYSTEMATIC REVIEWS	47
Research Questions	48
Systematic Review Methods	50
The Review Team	50
Strategy Development	50
Search Methodology	51
Review Results: Systematic Review 1: The Extent and Nature of Food Promotion to Children	67
Introduction	67
<i>Overview of the Evidence Base</i>	67

	<u>Page No</u>
Q1: (1) What promotional channels are being used to target children?	68
<i>Studies Under Review and Findings</i>	68
<i>Discussion</i>	71
Q1: (2) What is the relative spend in each of these promotional channels?	72
<i>Studies Under Review</i>	72
<i>Findings</i>	72
<i>Discussion</i>	74
Q1: (3) What are the time-trend changes?	75
<i>Studies Under Review</i>	75
<i>Findings</i>	75
<i>Discussion</i>	77
Q2: (1) What food items are being promoted to children?	78
<i>Studies Under Review</i>	78
<i>Findings</i>	79
<i>Discussion</i>	82
Q2: (2) What are the time-trend changes?	84
<i>Studies Under Review</i>	84
<i>Findings</i>	84
<i>Discussion</i>	86
Q3: (1) What are the principal creative strategies used to target children?	88
<i>Studies Under Review</i>	88
<i>Findings</i>	89
<i>Discussion</i>	94
Q3: (2) To what extent are these different creative strategies being used?	95
<i>Studies Under Review</i>	95
<i>Findings</i>	95
<i>Discussion</i>	96
Q3: (3) What are the time-trend changes?	97
<i>Studies Under Review</i>	97
<i>Findings</i>	97
<i>Discussion</i>	98
Conclusions from Systematic Review 1	98

	<u>Page No</u>
Review Results: Systematic Review 2: The Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour	99
Q1: How do children respond to food promotion?	99
<i>Studies Under Review</i>	99
<i>Findings</i>	100
<i>Discussion</i>	103
Q2: Is there a casual link between food promotion and children's food knowledge, preferences and behaviour?	104
<i>Introduction</i>	104
Q2: (1) Does food promotion influence children's nutritional knowledge?	108
<i>Studies Under Review</i>	108
<i>Findings</i>	109
<i>Discussion</i>	111
Q2: (2) Does food promotion influence children's food preferences?	113
<i>Studies Under Review</i>	113
<i>Findings</i>	115
<i>Discussion</i>	118
Q2: (3) Does food promotion influence children's food purchasing and purchase-related behaviour?	121
<i>Studies Under Review</i>	121
<i>Findings</i>	121
<i>Discussion</i>	126
Q2: (4) Does food promotion influence children's food consumption behaviour?	129
<i>Studies Under Review</i>	129
<i>Findings</i>	130
<i>Discussion</i>	135
Q2: (5) Does food promotion influence children's diet and health-related variables?	138
<i>Studies Under Review</i>	138
<i>Findings</i>	140
<i>Discussion</i>	145
Q2: (6) Other effects of food promotion	148

	<u>Page No</u>
Q3: If food promotion is shown to have an effect on children's food knowledge, preferences and behaviour, what is the extent of this influence relative to other factors?	149
<i>Studies Under Review</i>	149
<i>Findings</i>	151
<i>Discussion</i>	157
Q4: In the studies which demonstrate an effect of food promotion on children's food knowledge, preferences and behaviour, does this affect total category sales, brand switching or both?	161
<i>Studies Under Review</i>	161
<i>Findings</i>	162
<i>Discussion</i>	166
Conclusions from Systematic Review 2	169
Conclusions and Recommendations for Future Research	171
REFERENCES	174
Introduction	175
Narrative Review 1	176
Narrative Review 2	179
Systematic Review Methods	184
Included Articles for Systematic Review 1	185
Included Articles for Systematic Review 2	190
APPENDICES	
Appendix 1: Sample of Review Protocol	A1-A8
Appendix 2: Master List of Search Terms	A9-A11
Appendix 3: Search Strategies for Electronic Databases	A12-A28
Appendix 4: References Obtained through Personal Contact	A29-A30
Appendix 5: Outcomes of Reference Chasing Exercise	A31-A33
Appendix 6: References Found In-House	A34-A35
Appendix 7: List of Late Arriving Articles	A36-A38
Appendix 8: Justifications for Exclusions	A39-A50
Appendix 9: Data Extraction Forms for Systematic Review 1	A51-A106
Appendix 10: Data Extraction Forms for Systematic Review 2	A107-A175
Appendix 11: List of Advisory Panel Members	A176-A177
GLOSSARY OF TERMS	

TABLE OF FIGURES

Figure 1: Overview of Review Methods	52
Figure 2: Consulted Electronic Databases	54
Figure 3: Databases and Search Fields	55
Figure 4: Bibliography and Search Strategies	56
Figure 5: Total Yield of References by Source	58
Figure 6: Initial Relevance Criteria	59
Figure 7: Studies Meeting Initial Relevance Criteria	61
Figure 8: Promotional Channels by Advertised Food Brand by Spend	76
Figure 9: Trends in Advertising Spend Across the Top Ten Advertised Food Brands in the UK	87
Figure 10: Analysis of Studies Examined for Q2	107

LIST OF ABBREVIATIONS

CRD: Centre for Reviews and Dissemination, University of York

CSM: Centre for Social Marketing, University of Strathclyde

CTCR: Centre for Tobacco Control Research, University of Strathclyde

ESRC: Economic and Social Research Council

FAO: Food and Agriculture Organization of the United Nations

FT: Full text

IMCs: Integrated Marketing Communications

KPB: Knowledge, preferences and behaviour

MAFF: Ministry of Agriculture Fisheries and Food

NGO: Non-Government Organisation

PIA: Purchase Influence Attempts

PSA: Public Service Announcement (North America)

WHO: World Health Organization

LAY SUMMARY

Does Food Promotion Influence Children? A Systematic Review of the Evidence

Background

This review was commissioned by the Food Standards Agency to examine the current research evidence on:

- the extent and nature of food promotion to children
- the effect, if any, that this promotion has on their food knowledge, preferences and behaviour.

Before addressing these aims, two smaller reviews of related literatures were undertaken to provide some context. The first examined what we know about marketing and promotion and the effects it might have on children's consumer behaviour. It shows that promotion is just one part of the complex process of marketing and that measuring its effects on consumer behaviour (and disentangling these from other influences) is notoriously difficult. Nonetheless, advertisers do it all the time and base enormous budgetary decisions on the resulting data. The second small review looked at the field of alcohol and tobacco promotion, showing that hard and fast proof about promotional effects will never emerge; rather, judgements have to be made on the balance of probabilities. It also showed that, in the case of tobacco promotion, these have now been made.

Systematic Review Methods

The two main reviews on the extent and effects of food promotion used 'systematic' procedures. These are borrowed from medical science, where great care is needed to ensure that particular treatments are really safe and effective, and ensure that every possible source of evidence is identified and rigorously evaluated. The precise methods of this search and evaluation process are laid down in a detailed protocol, so that other researchers can replicate the review and check the conclusions it reaches. In short, systematic reviews are both rigorous and transparent. This is the first time that such procedures have been applied to a social phenomenon like food promotion, but it was felt that adopting them would help ensure that the review findings are relevant to and accepted by the many parties with an interest in this issue.

Three methods were used to identify potentially relevant research: an extensive search of electronic databases; searches of the 'grey' (not formally published) literature; and personal contact with key people in the field.

The Extent and Nature of Food Promotion to Children

Children's food promotion is dominated by television advertising, and the great majority of this promotes the so-called 'Big Four' of pre-sugared breakfast cereals, soft-drinks, confectionary and savoury snacks. In the last ten years advertising for fast food outlets has rapidly increased, turning the 'Big Four' into the 'Big Five'. There is some evidence that the dominance of television has recently begun to wane. The importance of strong, global branding reinforces a need for multi-faceted communications combining television with merchandising, 'tie ins' and point of sale activity.

The advertised diet contrasts sharply with that recommended by public health advisors, and themes of fun and fantasy or taste, rather than health and nutrition, are used to promote it to children. Meanwhile, the recommended diet gets little promotional support.

Effects on Children's Food Knowledge, Preferences and Behaviour

There is plenty of evidence that children notice and enjoy food promotion. However, establishing whether this actually influences them is a complex problem. The review tackled it by looking at studies that had examined possible effects on what children know about food, their food preferences, their actual food behaviour (both buying and eating), and their health outcomes (eg. obesity or cholesterol levels). The majority of studies examined food advertising, but a few examined other forms of food promotion.

In terms of nutritional knowledge, food advertising seems to have little influence on children's general perceptions of what constitutes a healthy diet, but, in certain contexts, it does have an effect on more specific types of nutritional knowledge. For example, seeing soft drink and cereal adverts reduced primary aged children's ability to determine correctly whether or not certain products contained real fruit.

The review also found evidence that food promotion influences children's food preferences and their purchase behaviour. A study of primary school children, for instance, found that exposure to advertising influenced which foods they claimed to like; and another showed that labelling and signage on a vending machine had an effect on what was bought by secondary school pupils. A number of studies have also shown that food advertising can influence what children eat. One, for example, showed that advertising influenced a primary class's choice of daily snack at playtime.

The next step, of trying to establish whether or not a link exists between food promotion and diet or obesity, is extremely difficult as it requires research to be done in real world settings. A number of studies have attempted this by using amount of television viewing as a proxy for exposure to television advertising. They have established a clear link between television viewing and diet, obesity, and cholesterol levels. It is impossible to say, however, whether this effect is caused by the advertising, the sedentary nature of television viewing or snacking that might take place whilst viewing. One study resolved this problem by taking a detailed diary of children's viewing habits. This showed that the more food adverts they saw, the more snacks and calories they consumed.

Thus the literature does suggest food promotion is influencing children's diet in a number of ways. This does not amount to proof; as noted above with this kind of research, incontrovertible proof simply isn't attainable. Nor do all studies point to this conclusion; several have not found an effect. In addition, very few studies have attempted to measure how strong these effects are *relative* to other factors influencing children's food choices.

Nonetheless, many studies have found clear effects and they have used sophisticated methodologies that make it possible to determine that i) these effects are not just due to chance; ii) they are independent of other factors that may influence diet, such as parents' eating habits or attitudes; and iii) they occur at a brand and category level.

Furthermore, two factors suggest that these findings actually understate the effect that food promotion has on children. First, the literature focuses principally on television advertising; the cumulative effect of this combined with other forms of promotion and marketing is likely to be significantly greater. Second, the studies have looked at *direct* effects on individual children, and understate *indirect* influences. For example, promotion for fast food outlets may not only influence the child, but also encourage parents to take them for meals and reinforce the idea that this is a normal and desirable behaviour.

Conclusions

This first UK systematic review of the research literature shows that:

1. There is a lot of food advertising to children.
2. The advertised diet is less healthy than the recommended one.
3. Children enjoy and engage with food promotion.
4. Food promotion is having an effect, particularly on children's preferences, purchase behaviour and consumption.
5. This effect is independent of other factors and operates at both a brand and category level.

This does not amount to proof of an effect, but in our view does provide sufficient evidence to conclude that an effect exists. The debate should now shift to what action is needed, and specifically to how the power of commercial marketing can be used to bring about improvements in young people's eating.

MANAGEMENT SUMMARY

Background

The Food Standards Agency commissioned this review to examine what, if any, research evidence there is that food promotion can influence the food-related knowledge, attitudes and behaviour of children. This is an extremely contentious issue and as a consequence great care has been taken to adopt rigorous objective and replicable procedures. Specifically, for the key review questions a 'systematic' approach was adopted.

The review is structured in two parts. Part 1 sets the context by examining the nature of advertising and promotion and the effects it can have. It also briefly examines the promotion to children of two non-food products, tobacco and alcohol, that have been the subject of equivalent debates about cause and effect. Part 2 contains the main and systematic components of the review, the first examining the extent and nature of food promotion to children, and the second the evidence on whether or not this affects their food knowledge, attitudes and behaviour.

Part 1: Narrative Reviews

Marketing, Promotion and Consumer Behaviour

Marketing is a complex mechanism for influencing consumer behaviour, and advertising and promotion form an important part of it. It is clear that consumers are actively involved in the consumption of advertising and cannot be characterised as passive or easily manipulated. Nonetheless, the effects of advertising are multiple and include knowledge, attitude and behaviour change by consumers themselves, stakeholders and significant others. Measuring the effect of promotion is very difficult but essential for marketers who need to assess the performance of their communications for future planning: consumer studies, econometrics and experiments are all used.

It is also clear that children are becoming more important to marketers, and that marketers are becoming increasingly sophisticated in their efforts to reach and influence them. Children become more adept at consuming advertising as they grow older, matching their cognitive and social development. Conversely, younger children may be particularly susceptible to the persuasive influences of promotion.

The Promotion of Tobacco and Alcohol to Young People

Evidence that tobacco advertising has an influence on children's smoking is dominated by consumer surveys. These have consistently shown that young smokers are more aware, familiar and appreciative of tobacco advertising and the imagery it promotes than their non-smoking peers. Furthermore, longitudinal studies have shown that this heightened knowledge and awareness of

tobacco advertising predicts the onset of smoking. This suggests (but does not prove) that tobacco advertising plays a role in both the onset and continuance of smoking by young people.

The literature on the effects of alcohol promotion on young people is less well developed although findings from consumer studies do provide some evidence of a link between alcohol promotion and young people's drinking.

This part of the review provides three important lessons. First, disentangling the influences on complex human behaviours is extremely difficult. There will never be any such thing as certainty or final proof. Evidence has to be collected and conclusions drawn on the basis of a balance of probabilities. In the case of tobacco, policy makers have decided that the case is strong enough and taken appropriate policy decisions; in the case of alcohol the evidence is much less clear and the policy options are therefore less apparent. Second, looking for evidence of promotional effects with population sub-groups like children requires consumer studies, as econometric, population based approaches do not provide a sufficient degree of disaggregation. Third, it shows that researchers tend to focus on advertising but that other promotional activity, and the cumulative effects of this, also needs to be considered.

Part 2: Systematic Reviews

Systematic Review Methods

Three main methods were used to identify potentially relevant research: an extensive search of electronic databases; searches of the 'grey' literature; and personal contact with key people in the field. The reference list of the original Ministry of Agriculture Fisheries and Food (MAFF) review (Young et al 1996) was also examined and an 'in-house' search for relevant literature undertaken at the Centre for Social Marketing (CSM). These search methods yielded 29946 potentially relevant titles and abstracts that underwent an initial stage of relevance assessment. From this, a total of 201 articles were considered relevant: 79 met the initial criteria for the systematic review of the extent and nature of food promotion to children, 109 met the initial criteria for the systematic review of the effects of food promotion on children's food knowledge, attitudes and behaviour, and a further 13 articles met the initial criteria for both systematic reviews.

Each of these 201 articles was then assessed against more stringent relevance and quality criteria. Sixty five articles describing 50 studies passed these criteria for the systematic review of the extent and nature of food promotion to children and 55 articles describing 51 studies passed these criteria for the systematic review of the effects of food promotion on children's knowledge, attitudes and behaviour. Finally, the included studies were subject to a final quality rating to gauge their relative quality; this was used to help assess which studies' findings should be given more weight in drawing conclusions from the evidence. Studies were categorised, on the basis of their rating scores, as higher, medium or lower scoring.

Systematic Review 1: Review of the Extent and Nature of Food Promotion to Children

Fifty studies provided evidence of the extent and nature of food promotion to children and were of sufficient methodological quality to include in the review. Forty two involved the collection of original data, and the remaining eight were review articles. The following questions were examined:

- i) What promotional channels are being used to target children? What is the relative spend in each of these promotional channels? What are the time trend changes?
- ii) What food items are being promoted to children? What are the time trend changes?
- iii) What are the principal creative strategies used to target children? To what extent are these different creative strategies being used? What are the time trend changes?

Q1: (1) What promotional channels are being used to target children?

Studies of television advertising dominate the published literature on food promotions to children. Only three studies did *not* examine television advertising (Consumers Union 1995, Hawkes 2002, Longman 2002), with only another two focusing on other forms of promotion as well as television advertising (Horgen et al 2001, Longman 2000). However, the heterogeneity of television was reflected in the variety of approaches used to research this medium.

Thirteen studies examined the differences between types of television output by examining both national broadcast networks and local independent terrestrial television channels, both national broadcast networks with cable networks/satellite channels, and national broadcast networks, local independent terrestrial television channels *and* cable networks/satellite. Food commercials were found to be more prevalent in advertising broadcast on the major national networks, while toy adverts were relatively more common on other forms of television (Barcus 1981, Consumers International 1999, Kunkel & Gantz 1992, Solomon et al 1982).

Eleven studies examined food advertising and food related public service announcements, six studies looked at product-programme tie-ins and two studies described aspects of the actual food content of television shows that were transmitted between the commercial breaks monitored.

Twenty four studies focused on either or both of the two children's time-slots: Saturday/Sunday morning television ('SMTV') and the mid-week, after-school 'children's hour' (the 'C' hour). Prime-time television where both adults and children were expected to be exposed to advertising together was examined in one study, 10 studies compared prime-time television with children's television, and three of these studies also examined 'post-watershed' television (aimed solely at adults), comparing this with prime-time, SMTV and the 'C' hour advertising.

Beyond television advertising, below-the-line promotional techniques such as sponsorship, in-school marketing, point-of-sale, free samples of food items, free gifts/tokens (premiums) with food items, loyalty/clubs, inter-active food, novel packaging, tie-ins with movies, tie-ins with computer software and other forms of wider brand building were examined.

Overall, the review identified a preponderance of television studies, most of which investigate output

during children's time-slots.

Q1: (2) What is the relative spend in each of these promotional channels?

Only two studies considered spend when quantifying the extent of food promotion to children (Dibb 1993, Horgen et al 2001). Original data was therefore obtained from AC Nielsen which provided figures for advertising spend in the UK of all food brands (in total and for each individual brand), broken down by promotional channel for the years 1994, 1998 and 2002. Both studies and AC Nielsen data confirmed that television was the primary medium used for advertising food to children: making up at least 75% of all advertising spend in the UK in recent years. Furthermore the most heavily advertised food brands were for products identified in this review as those most often promoted to children (i.e. breakfast cereals, confectionary, soft-drinks, savoury-snacks and fast-food restaurants).

Other research strategies were employed by a further 25 studies in order to gauge the extent of food promotions to children. Six studies compared the relative extent of food promotion to children with the extent of food promotion to adults and showed that food makes up a far greater proportion of promotions aimed at children than it does with adults. Seventeen studies investigated the extent of food promotion to children by comparing it to other products also aimed at children. These show that only toys threaten the pre-eminence of food in terms of advertising, and then only in the run up to Christmas.

Overall, the review found that television is the principal channel used by food marketers to reach children, and that food products dominate children's advertising.

Q1: (3) What are the time trend changes?

Only one study considered time trends in food promotion by spend (Horgen et al 2001). Both this and data obtained from AC Nielsen indicate that television has been by far the dominant promotional channel throughout the past decade, although spend appeared to be decreasing slightly in both relative and absolute terms by 2002.

The relative change in the amount of food promotion to children was also addressed by studies which compared the length of commercial breaks during children's television programs. Allowing for changes in advert length, frequency and any restrictions imposed on advertising, the extent of television commercials in general, of which half or more tend to be for food products, is increasing. Given the proliferation of channels and formats over time, the potential extent of exposure to food promotions seems likely to increase, even if the proportion of food adverts falls.

The review also identified an ongoing trend towards more branded rather than generic food products; one study looked at potential future trends in food promotion to children including below-the-line marketing activities such as branding, packaging and the advent of new 'fun' food.

Overall, the time trends show that the tendency for television to dominate food promotion, and food

children's advertising, are long term phenomena.

Q2: (1) What food items are being promoted to children?

Forty one studies conducted content analyses of children's food commercials to determine which sorts of products were being promoted. Recorded data were then subdivided (eg. by product, health status or nutritional content) by judges or raters. The resulting data were reported in mainly descriptive terms, and only rarely used inferential statistics. Sixteen studies looked at the relative amounts of advertising for specific foods, 21 attempted to estimate their actual nutritional content, while eight studies made comparisons between the 'advertised diet' and an acknowledged recommended diet.

Televised children's food promotions were found to be dominated by a 'big four' food items: breakfast cereals, confectionary, savoury-snacks and soft-drinks by virtually every relevant study. Adverts for fast-food outlets were also found to have "significantly" increased their share of children's adverts in recent years.

Overall, the food items which predominate in children's advertising were considered to be, or classified as, unhealthy and the advertised diet contrasts with that recommended by public health. The relative absence of advertising in support of the recommended diet is also noted.

Q2: (2) What are the time trend changes?

Thirteen studies in this review looked at time trends in the type of food being promoted to children. These show that the dominance of the 'big four' has been apparent since the 1950's, with these being joined in recent years by a fifth - advertising for fast-food restaurants. Advertising spend on fast food brands in the UK has been increasing in both relative and absolute terms over the past decade, mirroring trends found in the USA, with an increase in fast-food promotions being both relative to and replacing those for breakfast cereals as the most promoted product.

Overall, the literature presents a clear picture of time-trends in the extent to which different food items are promoted to children: promotions for staples and fresh foods have reduced to be replaced by promotion for the 'big four' items ('pre-sugared' breakfast cereals, soft-drinks, confectionary and savoury snacks) and fast-food outlets.

Q3: (1) What are the principal creative strategies used target children?

Thirty four of the studies included in this review addressed the issue of the nature of food promotions to children. A broad range of creative strategies were examined including the format of adverts (eg. characterisation, animation and tone), the theme of adverts (eg. whether it uses a storyline and if the tone is humorous or serious), the theme appeals of adverts (ie. what messages are used to attract the customer) and the use of disclaimers by adverts (ie. what information is provided about the product). The main method employed was again content analysis.

There was little agreement across studies over classification of the creative strategies to be analysed, coupled with the much greater potential for subjectivity by raters/judges. To account for this some studies used some kind of standardised rating scales or statistical validation of their coding systems and judges' ratings of creative strategies. Data was typically reported in descriptive terms; only nine studies used inferential statistics to describe relationships between creative strategies.

The characteristics of children's food promotions were examined in different ways. Sixteen studies looked at the characterisation in food adverts aimed at children and examined whether the advert was live action or featured cartoon characters, who speaks for the food product, actors or off-screen announcers, those who appear in the adverts, and if they are portrayed using the product being promoted (ie. eating).

Children's food advertising was characterised by off-screen male announcers and on screen male characters; other adults who appeared on-screen in food adverts tended to be portrayed as either comic-book heroes or villains. In terms of on-screen consumption of foods, one study reported that food advertising reports a "mixed-message" (Byrd-Bredbenner & Grasso 2000b) as actors observed consuming foods were reportedly slim and healthy, despite the majority of the food consumed being rated as of "low nutrient density".

The use of animation techniques in television food adverts was found to be particularly strongly associated with children's food adverts in comparison to non-food adverts aimed at children and adult-oriented food adverts (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Lewis & Hill 1998, Morton 1990). The use of animation or mixed formats was seen as being an indicator of the "light" or "humorous" tone of children's food adverts; much less humour was observed in both adult-oriented adverts and non-food adverts aimed at children (Atkin 1975/Atkin & Heald 1977, Doolittle & Pepper 1975, Lewis & Hill 1998, Morton 1990).

Theme appeals in children's adverts were examined in 15 studies, and food appeals identified included: appeals based on the food product's taste (such as sweetness), nutritional/health properties, physical appearance/texture, fantasy/adventure themes, fun/humour, enablement/capability, price, novelty/modernity and social aspects of the product (there is little consensus about the definition of these themes, so comparisons between studies are difficult). The most popular appeals used in the promotion of foods to children were hedonistic, including taste, humour, action-adventure and fun.

Of the food products identified as most commonly advertised to children, breakfast cereals were uniquely identified as those most likely to utilise nutritional or health claims as a theme appeal selling point (Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Consumers Union 1995, Hammond et al 1997a, Hill & Radimer 1997, Kotz & Story 1994, Reece et al 1999, Stern & Harmon 1984, Winick et al 1973).

Eleven studies examined the nature of disclaimers. Other products advertised to children, such as toys, were much more likely to use disclaimers than were food items and services, although the chief exception to this pattern was breakfast cereals. Intrinsic disclaimers/disclosures (referring to the

product) were said to be used to sell food, except fast-food restaurants which were thought to use extrinsic disclaimers (referring to the product's effect) to sell the brand. Toys, breakfast cereals and candy/gum tended to use informative disclaimers (referring to what the product does do), while fast-food restaurants tended to use restrictive disclaimers (referring to what the product does not do) (Muehling & Kolbe 1998).

Adverts designed to promote food to children were said to utilise 'pester-power' or 'purchase-influence-attempts' (PIA). A commonplace creative strategy said to employ pester-power was the use of premiums or competition prizes offering collectibles (eg. toys), and the use of celebrity was observed (although only limited cases). Six studies examining program-commercial tie-ins found the boundary between television shows and advert breaks to be less than clear cut. The food products which tended to sponsor shows, and utilise tie-ins, tended to be those categorised as pre-sugared or of low nutritional value, with the same food items or services (eg. fast-food outlets) being present. In-school marketing was also identified as an inappropriate channel for promoting foods to children (Consumers International 1999, Consumers Union 1995, Horgen et al 2001, Longman 2002) and, even in comparison to television, this type of promotion was felt to be particularly effective at reaching children.

Overall, the creative appeals in children's food advertising were found to concentrate on 'fun' and 'taste', rather than on health or nutrition (true both in comparison to other food promotions (aimed at adults) and other promotions aimed at children). The dominance of animation as a creative device was thought to illustrate this tendency. Fast-food advertising, which has become more prominent in recent years, tends not to describe the product advertised and focuses on the experience of the meal and the brand.

Q3: (2) To what extent are these different creative strategies being used?

Seventeen studies measured the relative extent to which these creative strategies are used to target children. Despite diverse ratings procedures, it was universally concluded that the food is promoted to children using themes such as taste rather than nutrition and fun or fantasy rather than health. Breakfast cereal adverts alone were found to regularly use nutritional appeals, regardless of whether or not these appeals were deemed to be misleading or disclaimers.

Seven studies compared the relative extent of different creative strategies by examining the creative strategies used to promote toys. Toy adverts were reported to take a more serious tone, use quite different theme appeals, display a much greater level of portrayal of the product in use, make greater use of disclaimers and consist of straightforward live action formats. Five studies compared creative strategies in children's food promotion with those used in the promotion of adult foods. Adult food adverts were found to take a more serious tone and use different theme appeals (ie. with nutrition, price, convenience, quality and health being more common and fantasy-adventure and fun less so).

Overall, despite some methodological weakness, key differences have been identified between children's food promotions and other types of promotion. Children's food adverts appeared to be more likely to use hedonistic themes such as fun and fantasy. The 'advertised diet' was universally found to differ from the recommended diet and was viewed as unhealthy by comparison.

Q3: (3) What are the time trend changes?

Nine studies explored time trends in the development of the creative strategies used to promote food to children. The basic creative strategies used to promote food to children are beginning to change. The rise of new media is giving rise to a host of new potential creative strategies, and the evolution of brand-stretching and 'globalisation' is allowing promotional messages to cut across many different media and also allowing increased tie-ins with below-the-line marketing activities.

Systematic Review 2: Review of the Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour

Fifty one studies provided evidence of how children respond to food promotion and were of sufficient methodological quality to include in the review. Thirty three of these studies were judged to be capable of providing evidence of a potentially causal relationship between food promotion and children's food-related knowledge, preferences and/or behaviour. The remaining eighteen studies were not capable of providing evidence of a potentially causal relationship between food promotion and effects on children, but did illustrate ways in which children respond to food promotion (for example, recall and enjoyment of adverts).

The review examined four questions:

- i) How do children respond to food promotion?
- ii) Is there a causal link between food promotion and children's food knowledge, attitudes and behaviour?
- iii) If food promotion is shown to have an effect on children's food knowledge, preferences and behaviour, what is the extent of this influence relative to other factors?
- iv) In the studies which demonstrate an effect of food promotion on children's food knowledge, preferences and behaviour, does this affect total category sales, brand switching or both?

Food knowledge was defined as including general perceptions of what foods are 'good' and 'bad' to eat, perceptions and understanding of what constitutes a balanced diet, perceptions and knowledge of the nutritional value of different food products, ability to understand the composition of processed foods, and understanding of nutritional concepts.

Food preferences were defined as including both liking for specific foods and preferences between different foods.

Food behaviour was defined broadly, as including purchasing and purchase-related behaviour, consumption behaviour, and diet and health status. Purchasing included both individual and household purchasing, while purchase-related behaviour referred to behaviour designed to influence parents to buy particular products. Consumption behaviour was defined as including one-off consumption (such as the amount of food eaten on one occasion), short-term consumption (such as daily selection of foods for consumption over a short period of time), and self-reported regular patterns of consumption behaviour (such as reported frequency of eating sweets). Studies which measured children's diet and nutrient intake, and health-related variables such as obesity and cholesterol, were also examined under behaviour.

Q1. How do children respond to food promotion?

Eighteen studies investigated children's responses to food promotion. These were primarily simple surveys with relatively small, usually non-randomly selected samples. Three of the studies were conducted in the UK. Seven different types of response were examined: recall of food advertising, liking for and attitudes towards food advertising, communication about food advertising, purchase-related behaviour perceived to be triggered by food promotion, responses to free gifts and packaging, desire for promoted foods, and qualitative insights into children's interaction with food promotion.

The studies indicated that children recalled food adverts (Hitchings & Moynihan 1998, Yavas & Abdul-Gader 1993, Radkar & Mundlay 2001, Barry & Hansen 1973) and that food adverts tended to be among their favourites (Yavas & Abdul-Gader 1993, Ward et al 1972, Donohue 1975, Lam 1978). Two studies found that children discussed food promotion with peers and families (Carruth et al 1991, Yavas & Abdul-Gader 1993). In three studies, children reported asking their parents to buy food they had seen advertised (Del Toro & Greenberg 1989, Yavas & Abdul-Gader 1993, Lam 1978), while four studies found that parents perceived that their children were influenced by food promotion to request specific foods and that they themselves responded to these requests (Taras et al 2000, Donkin et al 1992 & 1993, Hitchings & Moynihan 1998, Radkar & Mundlay 2001). Three studies indicated that free gifts and packaging attributes appeared to attract children's attention and stimulate demand for products (Carruth et al 2000, Atkin 1975a & 1978, Donohue 1975). Those studies which made statistical comparisons between different groups indicated that there were some gender (Del Toro & Greenberg 1989, Yavas & Abdul-Gader 1993), age (Del Toro & Greenberg 1989) and racial (Barry & Hansen 1973) differences in how children responded to food promotion.

Overall, the studies indicated that food promotion is noticed and enjoyed by children, and seems to influence their communication and shopping behaviour. This suggests that the creative strategies examined in Systematic Review One have persuasive power. The studies examined in this section were not capable of establishing any causal link between food promotion and food knowledge, attitudes and behaviour. For this, more complex research designs are needed.

Q2. Is there a causal link between food promotion and children's food knowledge, attitudes and behaviour?

Thirty three studies investigated whether there was a causal link between exposure to food promotion and children's food knowledge, attitudes and behaviour. They comprised 22 experimental studies, one observational study, one quasi-experiment, and nine cross-sectional studies.

Q2: (1) Does food promotion influence children's nutritional knowledge?

Eight studies investigated the influence of food promotion on children's nutritional knowledge. Five were experiments deploying a randomised controlled design and three were cross-sectional surveys examining the association between exposure to food advertising and nutritional knowledge. In terms of quality, two studies were higher scoring and six were medium scoring. All but one were conducted with North American samples in the 1970s and 1980s.

The eight studies reviewed provide modest evidence of an effect on children's nutritional knowledge. Four studies found that food promotion had an effect on or was associated with differences in nutritional knowledge. Three of these four studies provided evidence that exposure to food promotion for 'low nutrition' foods was associated with poorer nutritional knowledge. Of these, one was an experiment providing causal evidence (Ross et al 1980 & 1981) and the other two (Wiman & Newman 1989, Gracey et al 1996) were cross-sectional studies. The fourth study, an experiment (Peterson et al 1984), found that exposure to adverts for foods "high in nutritional value" increased nutritional knowledge, although it was impossible to separate out the effects of the adverts from other nutritional messages in this study.

Three studies found that exposure to food promotion had no impact on, or was not associated with changes in, children's perceptions of the healthiness of different foods or what constitutes a healthy diet. Two were experimental (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2) and one was cross-sectional (Atkin 1975b). The eighth study produced inconclusive results (Galst 1980).

The evidence is modest rather than strong. In two of the studies (one of which showed an effect and one where the results were inconclusive) it was difficult to separate out the effects of advertising from other exposure variables (Peterson et al 1984, Galst 1980); furthermore, studies which found effects tended to take more detailed knowledge measures than did the studies which did not find effects: the studies were not measuring the same effect.

Overall, the weight of evidence suggests that food promotion may have little influence on children's general perceptions of what constitutes a healthy diet, but that it can, in certain contexts, have an effect on more specific types of nutritional knowledge.

Q2: (2) Does food promotion influence children's food preferences?

Fourteen studies investigated the influence of food promotion on children's food preferences. Thirteen were experiments, and one was a cross-sectional study. The studies covered a wide age range, 2-18 years. The majority of the studies were conducted in north America in the 1980s. In terms of quality, four were higher scoring, five were medium scoring, and three were lower scoring.

The fourteen studies reviewed provided reasonably strong evidence of an effect on children's food preferences. Of the twelve studies that reported results (two did not), seven found that exposure to food promotion had an impact on, or was associated with significant changes in, children's food preferences (Goldberg et al 1978a & 1978b Study 1, Gorn & Goldberg 1980a, Stoneman &

Brody 1981, Kaufman & Sandman 1983, Borzekowski & Robinson 2001, Heslop & Ryans 1980, Norton et al 2000). Three of these were good quality experimental studies (Goldberg et al 1978a & 1978b Study 1, Stoneman & Brody 1981, Kaufman & Sandman 1983); they found that children were significantly more likely to prefer high fat, salt or sugar foods over lower fat, salt or sugar alternatives after exposure to food adverts. Three studies found that children were more likely to choose the advertised brand than a non-advertised brand of the same product type after exposure to food adverts (Borzekowski & Robinson 2001, Gorn & Goldberg 1980a, Heslop & Ryans 1980). One cross-sectional study found a weak association between television advertising and preferences for specific foods (Norton et al 2000).

One study found non-significant results in the direction of an effect (Goldberg et al 1978a & 1978b Study 2), and four (three experiments and one cross-sectional study) found no significant effects or associations (Peterson et al 1984, Clarke 1984, Ritchey & Olson 1983, Gorn & Florsheim 1985).

Overall, the stronger studies were generally more likely to find effects and the less strong studies were not, suggesting that there is reasonably robust evidence that food promotion influences food preferences.

Q2: (3) Does food promotion influence children's food purchasing and purchase-related behaviour?

Seven studies examined the impact of food promotion on children's food purchasing and purchase-related behaviour. Purchase-related behaviour was defined as behaviour intended to influence parents' food purchasing selections. Three were randomized controlled experimental studies, one was a natural quasi-experiment, one was an observational study, and two were cross-sectional surveys. In terms of quality, four were higher scoring, two were medium scoring, and one was lower scoring.

All seven studies found that exposure to food promotion had an influence on, or was significantly associated with, the specific purchase or purchase-related behaviour measured in each study. One experimental study (French et al 2001) found that promotional signage on vending machines significantly increased sales of low fat snacks in secondary schools independently of pricing variables. This was the only study in the review to provide robust evidence of a causal link between promotion and actual purchasing behaviour by children. One study involving a natural experiment (Goldberg 1990) compared the household purchase of cereals among English- and French-speaking children in Montreal. At the time of the study, English-speaking children in Quebec were exposed to and mostly watched American television, while French-speaking children were also potentially exposed to American television but tended to watch more Quebec television, which banned children's advertising in 1980; they were therefore less likely to be exposed to advertising for children's cereals. Regression analysis indicated that exposure to American television significantly increased household purchase of advertised cereals independently of income or language, suggesting that the difference could not be solely attributable to cultural differences between high and low cereal purchasing households.

Two experimental studies found that exposure to food promotion increased children's purchase influence behaviour observed in a natural setting (supermarket shopping with parents) (Stoneman &

Brody 1982, Galst & White 1976). The latter study also found that the more attentive a child was to television advertising, as opposed to television programmes, the greater the number of attempts to influence parental shopping purchases he or she made at the supermarket. One observational study (Reeves & Atkin 1979) and one cross-sectional study (Atkin 1975b) also found significant associations between amount of Saturday morning television viewed and frequency of making food purchase requests to parents, with 'heavy' viewers in both studies making more requests than 'light' viewers. The second cross-sectional study (Taras et al 1989) found a weak association between television watching in general and food purchase requests to mothers.

Overall, the studies provide strong evidence that food promotion influences children's food purchase-related behaviour. Both the methodologically stronger and less strong studies found evidence of effects. In all except one study, the effect was in the direction of increasing purchase requests for foods high in fat, sugar or salt; in the remaining study, the effect was in the direction of increasing low fat snack sales, in line with the promotional stimulus examined in the study.

Q2: (4) Does food promotion influence children's food consumption behaviour?

Eleven studies investigated the effects of exposure to food promotion on children's food consumption behaviour. Consumption behaviour was defined as including consumption of food on a single occasion, daily selection of foods for consumption over a short period of time, and self-reported patterns of consumption behaviour. Eight studies used randomized experimental designs and three were cross-sectional studies. In terms of quality, two studies were higher scoring, eight were medium scoring, and one was lower scoring. All the studies were North American.

The studies provided modest evidence of an effect on consumption behaviour. Two experimental studies found that exposure to food promotion had a significant effect on children's consumption behaviour: in one, it reduced their likelihood of selecting fruit or orange juice, compared to a sweet, for a daily snack (Gorn & Goldberg 1982/Gorn & Goldberg 1980b), and in one it increased boys' calorific consumption from a tray of snack foods (Jeffrey et al 1982 Study 2/Fox 1981). Three cross-sectional studies (Atkin 1975b, Ritchey & Olson 1983, Bolton 1983) found small associations, of varying degrees of strength, between exposure to television food advertising (as measured using television viewing) and frequency of snacking or consumption of specific foods, although the studies were of varying quality.

Two studies found variations in consumption behaviour, according to exposure to food promotion, but the results were not statistically significant and, therefore, no effect could be concluded (Dawson et al 1988, Jeffrey et al 1982 Study 1).

Four studies produced results which were inconclusive: Galst (1980) appeared to indicate that exposure to food promotion had a *positive* effect on consumption behaviour (ie. it reduced children's selection of sugared snacks), whereas Peterson et al (1984) found that exposure to food promotion had no effect on children's consumption behaviour, but it was not possible in either study to disentangle the effects of food promotion from other experimental stimuli examined at the same time. Two studies found that exposure to food promotion under certain conditions had an effect on consumption behaviour but that under other conditions it did not: in Cantor (1981) the effect was to

increase consumption of sweet foods, while in Gorn & Goldberg (1980a) the effect was to *reduce* consumption of ice cream.

Overall, the studies provide modest evidence of an effect of food promotion on consumption behaviour. Effects were sometimes inconsistent and were not found in all the studies, but were found in sufficient studies to suggest that food promotion can, in some contexts, influence children's food consumption behaviour.

Q2: (5) Does food promotion influence children's diet and health-related variables?

Six cross-sectional studies addressed this question. Four investigated the relationship between television viewing and children's diet (Bolton 1983, Coon et al 2001, Gracey et al 1996, Taras et al 1989). The other two studies examined health-related variables: one examined the relationship between television viewing and obesity (Dietz & Gortmaker 1985) and one (Wong et al 1992) examined the relationship between television and video viewing and cholesterol levels. One of the studies was higher scoring in terms of quality, four were medium scoring and one was lower scoring.

All four dietary studies found significant associations, of varying strength, between television viewing and dietary intake. Bolton (1983), a strong study, found that food advertising exposure as calculated from children's television viewing diaries was significantly related with children's snacking frequency, calorific intake and nutrient efficiency. Coon et al (2001) found a significant association between television being on during meals and children's diet. Taras et al (1989) and Gracey et al (1996) found weak evidence of a relationship between television watching and food purchase requests (in the first study) and fat intake (in both studies). The other two studies found significant relationships between television viewing and obesity (Dietz & Gortmaker 1985), and between television viewing/video game playing and high cholesterol (Wong et al 1992).

Overall, there was evidence of small but significant associations between television viewing and diet (four studies), television viewing and obesity (one study) and television viewing and cholesterol (one study). In five of the studies, the potential effect of food advertising on this relationship could not be disentangled from the general effect of television viewing. The effects may have been attributable to the impact of the advertising seen while watching television, the impact of other messages seen while watching television, such as programme content, or to the sedentary nature of the activity itself (Dietz & Gortmaker 1985). Alternatively, it is possible that a high level of television viewing acts as a marker for a complex set of attitudes and behaviours within the family which taken together lead to observed associations between television and children's food-related behaviour and diets (Coon et al 2001). One study, however, (Bolton 1983), measured the specific contribution of food advertising. The use of detailed television viewing diaries enabled a calculation of the extent to which each subject was exposed specifically to food advertising rather than simply the amount of time the subject spent watching television in general. The study found that the greater a child's food advertising exposure, the more frequent his or her snacking and the lower his or her nutrient efficiency.

Q2: (6) Other effects of food promotion

Finally, two experimental studies examined other attitudinal effects of food promotion. One experimental study (Lewis & Hill 1998) found that overweight children's self-perceptions and attitudes towards eating confectionery were affected both negatively and positively by exposure to food promotion. Another study (Gorn & Goldberg 1982)/Gorn & Goldberg 1980b) found that exposure to either confectionery adverts, fruit adverts or dietary public service announcements (PSAs) had no impact, either positive or negative, on children's attitudes towards snack food consumption.

Q3. If food promotion is shown to have an effect on children's food knowledge, attitudes and behaviour, what is the extent of this influence relative to other factors?

Eight studies investigated the relative influence of food promotion or television viewing on children's food behaviour, diet or health-related variables compared to one or more other factors known to influence children's food behaviour and diet. Seven were cross-sectional (Norton et al 2000, Coon et al 2001, Bolton 1983, Gracey et al 1996, Dietz & Gortmaker 1985, Wong et al 1992, Ritchey & Olson 1983) and one was experimental (French et al 2001). Two were higher scoring in terms of quality, four were medium scoring and two were lower scoring.

Overall, all eight studies provided evidence, of varying strength, that food promotion or television viewing have an influence on children's food behaviour and diet independent of at least one other factor. However, not all the studies examined, or had data that could easily be used to investigate, either the strength of the association between behaviour and food promotion relative to associations with other influences, or the relative magnitudes of the corresponding sizes of effects. More weight should be attached to the findings of the two stronger studies (Bolton 1983, French et al 2001).

One experimental study (French et al 2001) found that substantial (25-50%) price changes appeared to have a stronger influence than promotional signage on low fat snack sales from vending machines in secondary schools. However, promotion significantly increased low fat snack sales independently of pricing strategies.

One study (Bolton 1983) found that food advertising exposure had a small but significant impact on children's snacking frequency, nutrient efficiency, and, indirectly, calorific intake. The effect occurred independently of parental snacking frequency, child's age, parental diet supervision and child's missed meals. Food advertising exposure would seem to explain less of the variance in children's snacking frequency than parents' snacking frequency.

One study (Ritchey & Olson 1983) compared the influence of television watching on children's consumption of sweets with the influence of parents' frequency of consumption of sweet foods and parents' attitudes towards sweet foods. Television watching made a significant independent contribution to children's consumption of sweets, although to a lesser degree than parents' frequency of consumption.

One study (Wong et al 1992) found that time spent watching television and playing video games was

a significant and independent predictor of raised cholesterol in children.

One study (Dietz & Gortmaker 1985) indicated that television viewing was predictive, at marginally significant levels, of obesity and prior obesity in three to four years time, and that this effect occurred independently of prior obesity and family socioeconomic characteristics.

One study (Coon et al 2001) found that television being on during meals had a significant and independent influence on children's diet. It was not possible, from the results presented, to judge the strength of influence of presence of television during meals relative to the other influences examined.

Norton et al (2000) found that television advertising was significantly associated with preferences for a small number of foods, and that this occurred independently of other motivational factors influencing food preferences. It was not possible, from the results presented, to judge the strength of influence of advertising relative to the other influences examined. The remaining study, Gracey et al (1996), provided weak evidence that television watching had a small, marginally significant, independent influence on fat intake, but it did not assess the relative strength of the influence of television watching.

Overall, then, there is evidence from both methodologically stronger and less strong studies that food promotion or television viewing significantly influences children's food behaviour and diet independently of other factors known to influence children's food behaviour and diet. However, there is little evidence to show whether the influence of food promotion on children's food behaviour and diet is greater or lesser than that of other factors. In the one study (French et al 2001) which compared the size of the effect (as opposed to the strength of the association), the effect was small relative to substantial price changes.

Q4. In the studies which demonstrate an effect of food promotion on children's food knowledge, attitudes and behaviour, does this affect total category sales, brand switching or both?

Only one study (French et al 2001) measured sales to children, but it did not examine and compare brand and category effects. For a study to be able to answer this question directly, it would need to examine purchasing by children across both different brands within the same category and across different categories, and to be able to relate this purchasing to exposure to food promotion.

However, thirteen studies examined the impact of food promotion on brand preferences (five studies) or category preferences and behaviour (eight studies) independently of each other. The latter looked specifically at whether food promotion caused children to prefer or consume more foods in a 'less healthy' category than foods in a 'more healthy' category. All the studies were North American. Five were higher scoring in terms of quality, seven were medium scoring, and one was lower scoring.

Two of the brand preference studies (Borzekowski & Robinson 2001, Gorn & Goldberg 1980a) found that exposure to food promotion significantly increased children's likelihood of selecting the advertised food over a non-advertised food. Two studies found that it had no effect on brand

preferences (Clarke 1984, Gorn & Florsheim 1985), and one found only very modest effects in favour of the advertised brand (Heslop & Ryans 1980). The studies therefore provided modest evidence that food promotion influences children's brand preferences.

The category studies provided reasonably strong evidence that food promotion influences children's preferences. Of the eight studies which compared children's preferences or behaviour in relation to foods in higher fat, sugar or salt categories versus foods in lower fat, sugar or salt categories, four found that they were more likely to select higher fat, sugar or salt products in a one-off preferences test (Goldberg et al 1978a & 1978b Study 1, Stoneman & Brody 1981, Kaufman & Sandman 1983) or for a daily snack (Gorn & Goldberg 1982/Gorn & Goldberg 1980b). The fifth study (Goldberg et al 1978a & 1978b Study 2) found no significant effects on category preferences, while the remaining three studies produced results which were for various reasons inconclusive. In Galst (1980) and Peterson et al (1984), it was difficult to separate out the effects of food promotion from other elements of the experimental stimulus. Cantor (1981) found that exposure to food promotion under certain conditions increased children's tendency to consume more dessert foods from a 'sweet' category rather than fruit, but that under other conditions it did not have this effect. In addition, two of the five brand preference studies also took basic measures of effects on preferences for products in different categories (Gorn & Florsheim 1985, Gorn & Goldberg 1980a). The former found no effects on product preferences and the latter a modest effect.

Overall, there is evidence that food promotion causes both brand switching *and* category effects, with stronger support for the latter effect. Although no study provides a thorough comparison of the strength of both types of effect, both types of effect have been examined independently, and there is reasonably strong evidence that both occur. In other words, the effects of food promotion are not limited to brand switching.

Conclusions and Recommendations for Future Research

Conclusions

The first Narrative Review shows that promotion is just one part of the complex process of marketing, and that measuring its effects is notoriously difficult. Nonetheless, advertisers do it all the time and base enormous budgetary decisions on the resulting data. The second Narrative Review looks at the field of alcohol and tobacco promotion, showing that hard and fast proof about promotional effects will never emerge; rather, judgements have to be made on the balance of probabilities.

Systematic Review 1 indicates that children's food promotion is dominated by television advertising, and that the majority of this promotes pre-sugared breakfast cereals, confectionary, savoury snacks, soft drinks and, latterly, fast-food outlets. There is some evidence that the dominance of television has begun to wane in recent years. This review also shows that the advertised diet varies greatly from the recommended one, and that themes of fun and fantasy or taste, rather than health and nutrition, are used to promote this to children. Meanwhile, the recommended diet gets little promotional support.

Systematic Review 2 addresses the central question of whether this promotion actually has an effect on children. There are gaps in the evidence base, as discussed below. It is also impossible, as already noted, to provide incontrovertible proof of such effects. In our judgement, however, the review provides sufficient evidence to show that food promotion *can* have and *is* having an effect on children, particularly in the areas of food preferences, purchase behaviour and consumption. It is also clear that these effects are significant, independent of other influences and operate at both brand and category level.

Furthermore, two factors suggest that these findings actually understate the effect that food promotion has on children. First, the literature focuses principally on television advertising; as discussed below, the cumulative effect of this combined with other forms of promotion and marketing is likely to be significantly greater. Second, the studies have looked at direct effects on individual children, and understate indirect influences. For example, promotion for fast food outlets may not only influence the child, but may also encourage parents to take them for meals and reinforce the idea that this is a normal and desirable behaviour.

Most studies that uncover an effect conclude that this will be a harmful one. This is supported by the findings of the first systematic review showing a discrepancy between the recommended and advertised diets. However there is also evidence that promotion can have a beneficial effect, as in the vending machine study (French et al 2001) where promotion was shown to encourage a shift to lower fat options. Furthermore, there is no *prima facie* reason to assume that promotion will undermine children's dietary health; it can influence it, but this influence could just as easily be positive as negative.

It is this potential for benign influence that should form the focus of future research.

Recommendations for Future Research

The gaps in the literature confirm this need for a forward-looking research agenda:

- Research on the extent and content of children's food promotion comprises mainly content analysis studies. These tell us little about the advertisers' motives and objectives, or the audiences' response. Given that Narrative Review 1 clearly shows that both are actively involved in the communication process, future research should examine these two groups.
- The literature in both Systematic Reviews is dominated by television advertising studies. Other media and channels of communication are neglected, and the cumulative effect of modern brand-building 'integrated marketing communications' largely ignored. The even wider field of food *marketing* to children – which adds pricing, distribution and product design variables to the mix - is still less well explored. There is an urgent need for public health to learn more about such activities and particularly how they could be harnessed to encourage healthy food choices.
- The evidence on relative effects needs strengthening. In order to answer this question properly, different variables have to be monitored over time, and only one study did this. It

showed that substantial reductions in the price of a snack item had a bigger impact on sales than did promotion. But even here the link between the two variables is difficult to separate out. Broader, longitudinal research is needed to put more of this jigsaw together.

- Systematic Review 2 revealed a need for more precision and realism. Precision concerns measurement and analysis tools: for example, studies seeking to examine the relationship between exposure to television food advertising and diet should take more precise measures of exposure than aggregate hours of television viewing per week and should conduct appropriate analysis to enable the independence and relative strength of each influence to be judged. Realism, on the other hand, is a function of research design. There is a clear need for more real world longitudinal experiments; they combine the rigour of experimental design with naturalistic measures of behavioural effect.

Filling these gaps will require a multi-faceted research programme along the lines of a full test market. This will involve selecting one or more television areas and manipulating or removing agreed promotional and marketing variables whilst monitoring children's dietary knowledge, attitudes and behaviour. This is new territory for public health, but, as discussed in Narrative Review 1, is a text book exercise for commercial marketers. It will take time and money, and perhaps most challengingly of all, will depend on full cooperation between the food industry and public health. Long term success will also need to recognise market forces, by incentivising the healthy and disincentivising the unhealthy.

However it does seem a logical next step. If a commercial marketer were trying to decide whether advertising is an effective way of promoting food products to young people, and were presented with the level of evidence in this review, one logical option would be to proceed to a full test market.

It would also bring enormous benefits, providing:

- coherent, comprehensive data on the capacity for a range of marketing techniques and strategies to influence children's eating in the real world, recognising that this influence can be both positive and negative.
- escape from the blame culture that pervades this issue, with interest groups on the one hand characterising food promotion as the villain of the piece, and the industry trying to vindicate it on the other.
- the opportunity to learn how marketers' proven skills in influencing food-related behaviour can be focussed on beneficial outcomes.
- an effective way forward for policy makers along with regular feedback on progress.

Most fundamentally of all, it will provide an innovative lead to the rest of the world in a field that is as contentious as it is important.

INTRODUCTION

The Promotion of Foods to Children

This review was commissioned by the Food Standards Agency to examine the current research evidence on:

- the extent and nature of food promotion to children
- the effect, if any, that this promotion has on their food knowledge, preferences and behaviour.

It updates the review conducted in the mid 1990s (Young et al 1996) commissioned by the then Ministry of Agriculture, Fisheries and Food (MAFF). It also extends it in three ways. First, it looks at all forms of food promotion, not just television advertising. Second, it expands the definition of 'children' to cover 2-15 year olds. Third, it uses rigorous systematic procedures.

Background to the Review

Recent dietary patterns among children in the UK are giving cause for concern. The National Diet and Nutrition Survey published in 2000 reported that the majority of British children consumed more than the recommended amount of saturated fat, sugar and salt (Food Standards Agency 2000). The Chief Medical Officer's report for 2002 confirms that the proportion of overweight children aged between 6 and 15 years increased by 7% between 1996 and 2001. Levels of obesity reported among children of the same ages increased by 3.5% during the same period (Department of Health 2003).

Such evidence has prompted enquiries into the factors that might contribute to these trends. The commercial promotion of foods to children has been identified as one possible influence. There is therefore a need to understand what role, if any, promotion plays in shaping children's diets and what implications this might have for future policy on how food is promoted to children.

The role of promotion in the food choices of children has long been debated, both in the UK and further afield, and this debate is intensifying. Government, the food and advertising industries, Non-Government Organisations (NGOs), consumer advocates, public health advisors, academic researchers and parents are among the interested parties. There is general agreement about the extent and nature of food promotion to children, but little on the existence, nature and extent of any effect this has on their food knowledge, preferences and behaviour, and this, of course, affects views on the most appropriate policy options. Those who argue that food promotion has little impact on children's diets maintain that the current regulatory framework is both 'comprehensive', 'stringent' (Advertising Association 2001) - and certainly sufficient (Food & Drink Federation 2001).

Other stakeholders in the debate disagree. Sustain (previously the National Food Alliance) argues that food promotion to children is harmful and is lobbying the UK Government to introduce new legislation (Sustain 2002). Earlier this year, the House of Commons Health Select Committee

announced that its investigation into obesity would consider, among other issues, the role of food advertising (Periodical Publishers Association 2003). The Chief Medical Officer's annual report takes a slightly different perspective, proposing the adoption of the 'precautionary principle' (Department of Health 2003). In such a case, increased regulation of food promotion would be based on its *probable* influence on diet, as opposed to any absolute demonstration of its effects.

At an international level, a report published by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) has recently described the heavy marketing of energy-dense foods and fast food outlets as a probable cause of increasing obesity (WHO/FAO 2003). The report goes on to state that sensible strategies for preventing obesity might include the reduction of children's exposure to such marketing. Some countries have decided that the evidence of advertising's influence on children is strong enough to take legislative action. For example, Sweden has imposed a ban on all advertising to children under 12 years old and Greece has regulated the content of children's television advertising.

This review addresses the first part of this debate: whether or not there is evidence to show that food promotion is affecting children's dietary choices and health.

The Research Problem

Food knowledge, preferences and behaviour are influenced by a wide range of complex and dynamic factors. Unpicking these is difficult, and isolating the possible influence of just one variable - in this case promotion - particularly so. Moreover, social science research of this ilk can never provide final incontrovertible proof. It reduces uncertainty rather than producing certainty, and proceeds on the basis of testing plausible hypotheses and making judgements on the balance of probabilities. The Chief Medical Officer's comments about the precautionary principle noted above clearly recognise this dubiety. The job of this review has been to identify all the relevant studies, assess their quality and reach a composite judgement on what this literature can tell us about the problem.

This analysis has been set in the context of what is currently understood about how promotion works (Narrative Review 1) and its effects on children in the cases of tobacco and alcohol (Narrative Review 2). These confirm the complexity of the task at hand and the need to assess the balance of evidence rather than seek an unattainable absolute proof.

The research problem also called for a multi-disciplinary approach, drawing on nutrition, marketing, consumer behaviour, food policy, psychology, communications and economics. The Review Team combine expertise in all these areas: the Centre for Social Marketing at Strathclyde University has extensive experience in critically appraising the effects of advertising on health behaviour, and colleagues at the Universities of York, Oxford and London City have expertise in nutrition and food labelling, economics and econometrics, and food policy.

An Advisory Group was also established to guide the progress and development of the review. It comprised representatives from public health and nutrition, consumer behaviour, food marketing, the food industry and advertising (see Appendix 11).

Finally, as an additional quality control, a draft of the final report was sent out by the Food Standards Agency to 11 independent referees, and their views have been taken into account in the final report.

Methodology

Systematic reviewing procedures were used. These are extremely thorough and come from medical science where great care is needed to ensure that treatments are really safe and effective, and that every possible source of evidence is identified and carefully evaluated. This is the first time that such rigorous procedures have been applied to food promotion, but it was felt that adopting them would help ensure that the findings are relevant to, and accepted by, the many interested parties. It also fits with a changing policy culture which has raised expectations in terms of the transparency by which evidence is gathered, evaluated and synthesised, and seen systematic methods spreading from medicine to education, law and public policy (Petticrew 2001).

A systematic review is '*a review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research*' (Khan et al 2001). It involves pre-planning, transparency, comprehensivity and giving greater weight to 'higher quality evidence'. Planning and transparency are important to ensure objectivity and replicability. A 'protocol' for carrying out the review is developed which clearly sets out the review questions and methods (Khan et al 2001).

Comprehensivity means that all the evidence that might be relevant to the research question(s) is examined. However there are often problems in achieving total comprehensivity and in practice the search for relevant literature is typically limited by date of publication, language and the extent to which studies have been published. As the number of studies that reviewers may have to examine can be huge, a staged selection process is used. This involves making assessments of relevance and quality, with inclusion and exclusion criteria being made completely explicit.

The methods section, and related appendices, explains how these principles have been applied in this review.

Structure of the Report

The report is divided into two parts. Part 1 presents two Narrative Reviews which set a context for the main Systematic Reviews. The first examines what, in general terms, is known about marketing and promotion and the effects they might have on children's consumer behaviour. The second examines research on the effects of tobacco and alcohol promotion on young people.

Part 2 contains the two Systematic Reviews. It begins with the research questions and methods, which are followed by the findings of Systematic Review 1 (on the extent and nature of food promotion to children), and then Systematic Review 2 (on the effects of food promotion on children's food knowledge, preferences and behaviour).

A final section presents conclusions and recommendations.

PART 1

Narrative Reviews

Introduction to Narrative Reviews

Narrative Review 1: Marketing, Promotion and Consumer Behaviour

Narrative Review 2: The Promotion of Tobacco and Alcohol to Young People

Introduction to the Narrative Reviews

Two Narrative Reviews were conducted to provide a context for the main, Systematic Reviews.

The first explores the nature of marketing and promotion. It discusses the role of promotion, how strategies are developed, the range of effects they are thought to have and how these are measured. The special case of children's consumer behaviour is also considered. Many of these insights are derived from the business literature, and, in particular, the text books that are used to teach business students. These tend to be largely uncritical and assume that business methods in general and promotional activity in particular do produce effects; why would you train people in them otherwise? However, this should not be taken as pre-empting the other reviews. It is just intended to reveal the complexity of the phenomena they seek to unpick.

The second Narrative Review focuses on tobacco and alcohol promotion. Like eating, smoking and drinking are highly complex forms of consumption behaviour which are influenced by many forces. This review examines how researchers in these areas have sought to disentangle these influences and explore the link between promotion and consumption. The lessons for food are discussed.

It should be noted that these two reviews are *not* systematic. Systematic procedures would have been impractical in the first instance, and too costly in the latter.

Narrative Review 1: Marketing, Promotion and Consumer Behaviour

Marketing and Promotion Defined

(a) Marketing and the 'Four P's'

Marketing is a 'a social and managerial process by which individuals (consumers) and groups (companies) obtain what they need and want through creating and exchanging products and value with others.' (Kotler et al 1996). At its simplest, it comprises the manipulation of the 'Four P's', of 'promotion', 'product', 'price' and 'place' (Baker 1999). 'Promotion' covers all the means by which an organisation communicates with its target audience in an effort to persuade them to buy their goods or services. The 'product' is the company's offering and can include both goods and services; 'price' is what the consumer has to pay for the firm's offering and 'place' concerns the distribution strategy (Kotler et al 1996).

Marketers see the 'Four P's' as a toolkit which is manipulated and blended in order to influence consumer behaviour (Kotler et al 1996). Consumer behaviour is the process by which people select, purchase and use products (or services) in order to satisfy their own needs and desires (Solomon et al 1999). By creating complementary promotion, product, price and distribution strategies, marketers seek to influence consumers so that their needs and desires are directed towards their firm's offering (Kitchen 1999).

Contemporary marketers are putting increasing emphasis on 'relational' thinking (Gronroos 1997) which focuses on building long term, sustainable relationships with consumers, rather than simply generating isolated transactions. Customer loyalty and retention are key concerns, with 'retention strategies' including branding, direct marketing and loyalty schemes.

(b) The Role of Promotion and the Promotional Mix

The term promotion encompasses all the communication which takes place between the firm and its (potential) consumers. This communication is persuasive in that it is designed to stimulate a pre-defined response from the target group (Kotler et al 1996). It takes many forms, including mass media advertising personal selling, sales promotion, direct mail and point-of-sale merchandising (Kitchen 1999). Technological developments have added electronic and digital media, such as the internet and mobile-phone technology, to this 'promotional mix' (Crosier 1999b), which offer opportunities for interactive communications (Pavlou & Stewart 2000).

Managing the promotional mix - or 'integrated marketing communication' (IMC) has become a key principle of successful business communications (Crosier 1999b).

(c) Developing the Promotional Strategy

The promotional strategy lays down the attributes of a campaign, defining the target market for the communication (ie. who they want to reach and influence), the content and tone of their message (ie. what they want to say to their target market and how they want to say it), the choice of media to convey this message (eg. television advertising, point-of sale merchandising, sponsorship or a combination of different media), the desired effect on the target market (ie. how they want the target group to respond), and proposed methods for evaluating the success of the strategy. These decisions are carefully bedded into the marketing strategy which also covers product, pricing and distribution decisions.

In each case thinking is guided by qualitative and quantitative research into consumer motivations, preferences and behaviours (Kitchen 1999).

(d) Models of Communications Effects

There is no one, agreed model of how consumers respond to promotion, just as there is no single model to explain how media communication as a whole works. However both literatures do offer some useful insights.

The most important of these is that there has been a fundamental change in our understanding about how people consume the media (Jones & Jones 1999). Traditionally both advertising and the media were thought to exert a powerful and direct effect on people. The hypodermic syringe was a favoured metaphor, with the audience being seen as susceptible to the message as a patient is to an injection (Glover 1984). Thus, early, models of advertising were hierarchical with effects seen as predictable and uniform (Barry & Howard 1990). Audiences were passive and easily manipulated (Lannon & Cooper 1983).

Although such thinking still has some currency, mainly because it provides a comfortingly straightforward way of thinking about advertising, it has also been the subject of at least two major criticisms (eg. Barry & Howard 1990). It fails to acknowledge the role of other potential influencing factors, such as social relations (Jones & Jones 1999) or economic forces, in mediating people's responses to messages. Nor can it account for variations in how different people respond to communications or the possibility that people might actively reject or subvert messages (Lannon & Cooper 1984).

More recent thinking about promotion has tried to build in these complexities. Communication is now seen as a two-way process with the consumer playing a central role in determining whether and how messages are received and acted upon (Kitchen 1999).

(e) The Range of Promotional Effects

Marketing text books typically talk about promotion affecting the consumer in three ways: their knowledge (eg. of the firm or its products); attitudes (eg. their feelings and emotions about these)

and behaviour (eg. purchase or consumption). These effects are assumed to be possible, and case studies are used to illustrate this potential. The hard empirical data on whether they actually materialise for specific products is discussed in Narrative Review 2 (for tobacco and alcohol) and Systematic Review 2 (for food).

Three other aspects of promotional effect are discussed in the literature:

Levels of effects. McQuail, (1994) points out that effects do not just occur at an individual, but also at an intermediate and societal level. For example, at the intermediate level promotion may influence the perceptions and behaviour of significant social groups (Crosier 1999a) such as peers or the family. At the societal level commercial messages can influence social and cultural norms about, for example, the acceptability of a particular product. Both these effects can translate into an influence on the individual. Furthermore, the literature stresses that marketers deliberately seek to influence such stakeholders, whether they be parents or policy makers. Promotion is one tool for achieving this influence.

It is important to note that the literature analysed in the other reviews focuses almost exclusively on individual effects.

Short and long term effects. Promotional strategies can influence consumers in either the longer or shorter term. Different promotional media and creative strategies are useful for obtaining these different effects and promotional planners will consider the relative strengths and weaknesses of each (Brassington & Pettitt 1997). For example, advertising is most often used to establish brand image and create desirable brand associations in the minds of consumers. By using advertising in this way, marketers can build relationships with consumers, gain their loyalty and influence their purchase behaviour in the longer term. In-store promotions are felt to be less capable of building relationships with consumers and are more often used to persuade them to engage in one-off transactions or to purchase over the shorter term.

The other reviews cover both short and long term effects, but for practical reasons the focus tends to be on the former.

Brand switching or category sales. There is an active debate as to whether promotion is purely concerned with consumer perceptions and behaviour within a particular product category (eg. encouraging consumers to move from Regal to Lambert and Butler), or whether it can affect whole categories (eg. recruit new smokers or increase the overall consumption of current ones).

It is extremely difficult to answer this question in general terms. On the one hand a review of some twenty articles by Luik and Waterson (1996) supported the first view, of advertising as a purely inter-brand competitive tool. On the other it seems improbable that effects that have been established at a brand level can never take place at a category one. If advertising can persuade the consumer to change from having Heinz to Cross & Blackwell beans for tea, why cannot it not shift the choice from beans to pizza?

Furthermore, the distinction between brand and category often blurs. For example, if a consumer has to travel from Glasgow to London she can choose between train and plane, and BA or Virgin

(planes or trains) advertising might plausibly help her to make the decision. Is this a brand or category effect?

The only sensible way to resolve this dispute is to look within particular markets. The other reviews do this.

Measuring Promotional Effect

(a) The Importance of Measuring Effect

Marketers use various empirical measures to investigate the effects of their promotional efforts on consumers. This is recognised as complex and difficult task because of the extent and diversity of promotional stimuli, the range and nature of possible effects, and the need to allow for socio-cultural and individual influences on consumer behaviour (Kitchen 1999). Disentangling these effects can create very real challenges.

Despite these difficulties, marketers can and do measure the effects of promotion; and they rely on such research to make enormous investment decisions and guide the development of multi-million pound promotional strategies.

(b) Methods for Measuring Effect

Three complementary approaches are used.

(i) Econometric Studies

Econometricians develop and test models of advertising effect to see whether variations in the amount of advertising bring about changes in consumption behaviour. These models have to be both sophisticated and complex if they are to allow for all possible influences. They also depend on extremely good longitudinal data about advertising spend and consumption patterns. When successful such research can produce robust results.

However it is difficult for non-commercial researchers to use this approach because the good advertising and consumption data is commercially confidential. As a result they have to depend on aggregate estimates. This reveals little about the potential influence of promotion on sub groups like young people.

In addition, the econometric studies' exclusive focus on consumption means that they cannot cover potential effects on perceptions and preferences. These drawbacks mean that econometric studies have not been used to address the debate about promotion and children's diet.

(ii) Consumer Studies

These tackle the problem from the perspective of the target audience, measuring and correlating advertising and consumption variables. For example, awareness and appreciation of an advertising campaign can be compared with product purchase. If advertising is having an effect then there should be some degree of independent correlation between the two sets of measures.

A variety of qualitative and quantitative methodologies are used to calibrate not only behavioural indicators like product purchase, but also cognitions and emotions. As these studies analyse effects at the level of the individual, they have particular explanatory power and can be used to inform the development of future communications.

This approach has been used to address the debate about promotion and children's diet.

(iii) Experimental Studies

In an experimental study, the independent variable is manipulated systematically so that its effects on the dependent variable can be observed and measured (Hedrick, Bickman & Rog 1993). The emphasis is on maximising internal validity and the control of all possible confounding variables so that causality can be established (Denscombe 1998). For example, in marketing research the content of a promotional message (the independent variable) might be manipulated to observe changes and explore effects on consumer knowledge of a given product (the dependent variable). The principal disadvantage of experiments is a degree of unreality; circumstances are artificial and effects typically short term.

One solution for marketers is to increase the scale of their experiments using 'test markets', where, for example, the whole population in a given television area will be exposed to a promotional campaign and their consumer behaviour is then compared with that of a control population in another television area.

Experiments have been used extensively to address the debate about promotion and children's diet.

The Special Case of Children

(a) The Importance of the Children's Market

Children have become an increasingly important target group for marketers in recent times (Valkenburg 2000) largely because their buying power is expanding; they have become more capable of making their own purchase choices and can also strongly influence household purchases. This influence can even extend beyond the immediate household to influence others such as grandparents and peers (Baxter 1991). Children also have longer-term potential for marketers as 'life-time' consumers. Companies targeting children are keen to create, foster and develop brand loyalty among young people to encourage continued, regular consumption (Valkenburg 2000).

This has led to a dramatic growth in marketing to children (John 1999a) and children are now growing up surrounded by advertising, branding and other forms of promotion (Leonhardt &

Kerwin 1997). Marketers are becoming increasingly sophisticated in developing promotional strategies and techniques capable of influencing child consumers. They have also recognised the need to be more attuned to the children's market; they now base their strategies on a detailed understanding of children and their underlying interests, motivations, values and beliefs (Acuff 1997). To get this information, market researchers commonly undertake consumer behaviour research with children and teenagers. Evidence of children's developmental psychology and how they interact with promotion can also enhance marketers' abilities to develop effective and age-appropriate strategies.

(b) Stages of Cognitive and Social Development

The most comprehensive account of children's cognitive development is Piaget's theory of logical development which categorises children into different stages of development (Goswami 1998). They start in the *sensori-motor stage* which occurs between birth and two years of age. The child uses their basic sensory and motor functions to build up knowledge and hypotheses (Goswami 1998). The *preoperational stage* occurs between 2 and 7 years when the child's cognition is characterised by *perceptual boundness* and *centration*. *Perceptual boundness* refers to a tendency to focus on and respond to only the immediate perceptual aspects of an object or the environment. *Centration* describes a similar tendency to fix on only a limited amount of information (eg. one single aspect of an object) rather than distributing attention equitably across the entire situation (Flavell et al 1993).

During the *concrete operational stage* (between 7 and 11 years) children are more capable of considering multiple aspects of an object or situation simultaneously (Goswami 1998) and can reflect upon their surroundings in a more thoughtful way. At the *formal operations stage* (between 11 years and adulthood) child's capabilities to think abstractly improve even more and they can begin to hypothesise about stimuli and the relationships between them. Their ability to be critical and think reflectively also becomes more sophisticated.

Piaget's theory is still well respected but has also been criticised. For example, current views doubt that the changes that occur are as 'stage-like' as suggested (Flavell et al 1993). Furthermore, the theory does not account for all cognitive changes that children experience, for example it does not explain how children's information processing abilities develop (Flavell et al 1993).

Information-processing theories are a more recent approach to the study of cognitive development (Flavell et al 1993). Although there is no generally accepted model of information processing for children, some developmental trends have been reported (Chandler & Heinzerling 1998). Throughout childhood, children develop more sophisticated and flexible ways to deal with information and there is now widespread agreement that older children have greater information-processing capacities than do younger children (Flavell et al 1993). More specifically, in the consumer behaviour literature, children have been categorised into three segments based on their information processing abilities (Roedder 1981) that reflect how children progress from being unable to utilise information storage strategies and draw on previous knowledge, to being strategic processors of information.

The literature on children's *social* development is also relevant to consumer behaviour issues (John 1999b), particularly developments in social perspective taking. Selman (1980) describes how children's abilities to understand different perspectives progress through a series of stages. Very young children (between 3 and 6 years) are described as egocentric as they are completely unaware of any perspective other than their own. As they grow older, children become increasingly more appreciative of other people's perspectives and capable of considering different viewpoints.

Cognitive and social development during childhood sheds light on how children respond to advertising and promotion.

(c) Children's Interactions with Advertising

Consumer socialisation refers to the process of acquiring consumption related knowledge, attitudes and skills (Ward 1974). A large body of literature on children's consumer socialisation has accumulated in nearly thirty years covering topics such as children's knowledge of brands and advertising, decision-making strategies among child consumers and parental influence and negotiation strategies (John 1999b). Most relevant here is research investigating the nature of children's interactions with advertising and its influence on their cognitions, emotions and behaviour. Much of this literature is North American and was undertaken in the 1970s. It also focused on children's interactions with television advertising in particular. At this time, television advertising was the primary medium for commercial messages directed towards children and newer elements of the promotional mix had not yet emerged. Despite these limitations, it is likely that aspects of children's consumer behaviour are universal across cultures (Morley 1968) - and particularly to similar cultures like that of the UK- and that principles about children's interactions with television advertising are generalisable to other forms of promotion.

The literature concentrates on several key areas (Young 1990, John 1999a): children's ability to discriminate between programming and advertising, their understanding of advertising intent, their recognition of bias and deception in advertising and their use of cognitive defences against advertising.

Discriminating between television adverts and programming. As children get older, they can recognise what is television advertising and discriminate between this and other forms of programming (John 1999a). The research suggests that this ability emerges between the ages of 4 and 7 years although some studies report this ability in children as young as 3 or 4 years. For example, one study found that, in a sample of 4 year olds, 62.5% were able to identify programming when shown and 70% could identify adverts (Butter et al 1981).

Discrimination studies also report differences between how younger and older children distinguish between programming and advertising. Younger children have consistently demonstrated that they draw distinctions on the basis of salient perceptual characteristics. For example, Ward et al (1972) reported that younger children explained the difference between programming and advertising in terms of advertising's typically shorter duration. Older children were more capable of recognising the critical functional distinction between them: that programming exists primarily to entertain and advertising to persuade. These findings are important because, although younger children may be

able to draw a distinction at a more superficial level, they fail to grasp the important underlying difference between advertising and programming (John 1999a). Observations that younger children base their explanations on such perceptual features fit well with cognitive development theory that stresses younger children's tendencies towards perceptual boundness and centration.

Understanding the persuasive intent behind advertising. A critical area of research centres on children's understanding of advertising's purpose. Researchers have keenly investigated the extent to which children recognise that what they are watching is designed to persuade and invite purchase of the advertised product or service. Although the ability to discriminate between programming and advertising emerges between 4 and 7 years, empirical research suggests that children may not develop an understanding of advertising's persuasive intent before 7-8 years (John 1999a).

Robertson & Rossiter (1974) hypothesise that, to understand persuasive intent, children need to be capable of discriminating between programming and advertising, understanding that advertising has both a source and an intended audience, appreciating symbolism and recognising the differences between products as advertised and as they exist in reality. This provides a useful theoretical framework for this problem (Young 1990).

The study found that most children were able to attribute both assistive (ie. informative) and persuasive intent to advertising, but that attributions of persuasive intent were more frequently observed among 10-11 year old children. Higher levels of parental education also improved children's ability to recognise persuasive intent.

These effects can be explained by social theories of perspective taking, as younger children are unable to take other people's perspectives and cannot reason about the underlying motivations for advertising (Young 1990).

Recognition of bias and deception in advertising. When they reach 8 years of age and have some understanding of intent, children also begin to recognise bias and deception in advertising (John 1999a). For example, in the Robertson & Rossiter (1974) study, 64.8% of 6-7 year old children reported 'trusting all commercials' compared with only 7.4% of 10-11 year olds. Older children are also more capable of reasoning why advertising might be untruthful and provide sophisticated reasons for the motives underlying the bias.

Research has also explored children's affective responses to advertising. With an understanding of advertising's intent and an ability to recognise bias and deception in adverts, children have been shown to be less trusting of and display less liking for advertising. Robertson and Rossiter (1974) also reported dramatic differences in children's liking for 'all advertisements' among different age groups with only 25.3% of 10-11 year old children reporting liking all adverts compared with 68.5% of 6-7 year olds.

Cognitive Defences. At around the age of 8 years, there is evidence that children are *beginning* to respond to advertising in a more sophisticated way. At this stage, they start to evaluate and consider the messages to which they are exposed and are capable of responding to them in a more mature and informed way (John 1999a). Prior to this, children demonstrate very little ability to

accurately judge and critically reflect upon commercial messages. Children develop a 'healthy scepticism' of advertising (Young 1990) and use their knowledge and understanding of it as some form of 'cognitive defence.'

However, an improved understanding of advertising does not always result in more discerning responses (eg. Ross et al 1984). Theories of information processing can explain why children do not always use this knowledge to analyse and critically reflect upon advertising messages (John 1999a). The ability of children between 8 and 12 years old to retrieve and make effective use of the information they have stored in memory is still developing and children under the age of 8 years of age experience real difficulties in retrieving this information. Often, they can only utilise stored information when prompted, during exposure to a commercial communication for example (Roedder 1981). Children at an earlier stage of development may therefore be more susceptible to commercial influence.

(d) Promotional Strategies for Children

Marketers have developed a number of strategies for ensuring that their communications are both liked by children and are effective in influencing them in the desired way. There now exists a multitude of different marketing techniques aimed at the child consumer (Valkenburg 2000).

Child-oriented promotions, like those for adults, are well rooted in research. Marketers conduct research with children to gain insights into their motivations, values, preferences, and interests. Theories of children's cognitive and social development also help them to successfully segment their market. Marketers exploit developmental differences among children of different ages by tailoring their promotional efforts to suit the developmental stage of the children being targeted by the communications. They know that there are great differences in what promotional strategies will work best with children of different ages (Stipp 1993).

So how then do marketers use their knowledge of children's development to create appealing and appropriate promotions for their products? Children are targeted with commercial messages in a variety of different places including at home, at school, and in their local community (Acuff 1997) using a range of different media (Stipp 1993). In addition to the traditional forms of advertising (television, print, radio and cinema), marketers place important emphasis on reaching children through interactive communications (eg. the internet) (Austin & Reed 1999), merchandising (eg. spin-off products from child-targeted television shows and films, licensed characters, etc.), innovative packaging (Sensbach 2000), the sponsorship of educational materials in schools and through child-oriented sales promotions (eg. give-aways on cereal packets, free toys at fast food restaurants, etc.). Child marketers have also recognised the power of other non-traditional marketing tools such as loyalty programmes (Acuff 1997).

In terms of developing the content and style of their promotions, marketers use different strategies for children of different ages. Given that younger children (3 - 7 years) are more limited in terms of their cognitive abilities, very simple approaches are used. Marketers recognise that 'impact' is important when promoting products to children (Clark 1997). Verbal communications mean very little at this age so marketers rely on graphic techniques such as innovative, colourful and exciting

packaging combining appropriate symbols and characters (Sensbach 2000) in order to direct attention towards their products. To keep children interested in a promotion, marketers rely on the use of eye-catching and action-filled advertising (Matthews 1997).

Character-merchandising is another useful strategy for younger children who respond well to friendly, age-appropriate characters with whom they can form bonds (Clark 1997). Such strategies are less appropriate for slightly older children (aged 8-12 years) who are moving towards adult tastes (Acuff 1997). These children are also more cognitively sophisticated so marketers tend to concentrate on developing more complex and abstract promotional concepts. The impressionable nature of children of this age is also often harnessed using character-merchandising featuring 'real-life' heroes such as music or sports stars (as opposed to 'childish' cartoon characters, for example) (Acuff 1997).

Marketers recognise that adolescence reflects an important time of change for young people who become increasingly selective about what interests them. They know that creating appealing promotion for children requires a different approach and that social acceptance is extremely important (Matthews 1997). Because teenagers are extremely image-conscious and keen to affiliate with particular social groups they are particularly sensitive to the power of branding. Marketers therefore create sophisticated promotions and brands that contain symbolism and imagery relevant to and consistent with the social norms of the target group.

(e) The Effects of Promotion on Children

As with adult promotions, marketers seek a variety of effects and these are contingent upon the objectives of the communication. Again, effects are sought across knowledge, attitudes and behaviour, and children can be influenced by effects operating at wider socio-cultural levels, more intermediate levels and at the level of the individual. As some children have autonomy over their own consumption choices, promotional strategies will seek to influence children directly by creating a desire for a particular product and intentions to purchase that product. Children may be encouraged to purchase a product that is new to them, to increase their consumption of a product they already consume or to continue to purchase a given product over the long term.

As children don't always buy their own products and consumption choices are often made on their behalf, marketers create appeals that are designed specifically to influence children's *purchase request* behaviour. Promotions are used to create a desire for a particular product among children in such a way that they are encouraged to influence their parents or other adults (through requests) to purchase the desired product on their behalf (Marshall 1997).

Marketers also engage in what is known as 'cradle-to-grave' marketing which is essentially relationship marketing with children. In recognition of children's potential as consumers to a firm over their lifetime, promotion can be used to create and foster ongoing relationships with them. Usually strategies of this kind focus on branding in an effort to develop an emotional and enduring connection between the child and the brand. Lindstrom (2003) stresses the importance of brands to children of all ages; the relationships that children form with brands often become central

components of their lives (Ji 2002). Promotion is used to encourage children to develop awareness of and preferences for a particular brand.

(f) Research Challenges

Trying to measure how promotion influences general consumption is difficult enough. But establishing any specific effects on children is even more challenging, and presents new problems to overcome.

Consumer studies and experimental research have been used to investigate the effects of promotion on children. Econometric methods are less useful in this context because they often rely on aggregate data that provides little insight into how children, as a specific subgroup, are affected. As with research conducted with adult populations, consumer studies can provide deeper insights into the processes of influence and can facilitate an understanding of why certain psychological or behavioural effects might occur. However, the choice of methodologies used in consumer behaviour research with children is critical. Limitations in children's cognitive and social development must be accounted for in the design of the research. The methods used must be capable of being understood by children, and must also gain their interest in the activity and maintain their concentration throughout.

As children below a certain age often struggle to think in abstract terms, methods based on written or verbal investigation techniques (such as self-completion questionnaires and standard interview techniques) may result in an overly pessimistic view of what children understand (Young 1990). In these cases, children's capabilities are masked by their inability to cope effectively with the methodological 'task'. Visual aids and materials have been shown to be more useful for younger children, particularly those under the age of 7 years. Contradictory findings regarding the age at which children develop particular consumer skills may, in part, be attributable to methodological differences between studies. Encouraging children to respond using nonverbal indicators (Young 1990) may lead to more accurate findings regarding children's understanding or knowledge of promotions.

There is also a growing interest in media literacy among children. As they lack the ability to respond to promotion in the way that adults do, research has explored the potential to educate children about advertising and promotion, and help them to become more critical of it. Research into the effectiveness of this type of approach is in a relatively embryonic state, although there is some evidence that it can have a positive influence on consumer learning (eg. Hobbs & Frost 2003).

Implications for the Food Standards Agency Review

This review has shown that promotion is an important part of the wider managerial discipline of marketing. It comprises a mix of different communication channels. Recent thinking suggests that consumers are actively involved in the consumption of promotion and that, adult consumers at least, cannot be characterised as passive or easily manipulated. Nonetheless, the *intended* effects of promotion include knowledge, attitude and behaviour change by consumers, stakeholders and

significant others. Whether or not they succeed will be discussed in the more specific reviews presented below, although it should be noted that the literature focuses almost exclusively on individual effects.

Answering questions about effect is difficult, but marketers do it on a regular basis to help guide what are huge investment decisions about their promotional budgets. They use a mixture of econometric, consumer and experimental research methods. The latter two approaches have also been used to unpack the relationship between promotion and children's food preferences and behaviours. In addition, there is a need to disentangle brand and category effects, and this can best be done at the level of the individual industry. The review on food promotion does this.

Children present a very valuable market, and marketers are becoming increasingly sophisticated in their efforts to service it. It is clear that younger children do not have the cognitive and social skills to process advertising effectively and equally apparent that marketers are using their improving understanding of child development to produce the most appealing and effective communications. Conducting research with children on advertising effects presents particular challenges, and this has been taken into account in assessing the quality of the studies included in the food review.

Narrative Review 2: The Promotion of Tobacco and Alcohol to Young People

Introduction

Like eating, smoking and drinking are complex forms of consumption behaviour that are influenced by a range of environmental, socio-cultural, behavioural and psychological factors (Hastings & Aitkin 1995, Cooke et al 2002). They are also behaviours that have significant social and health consequences, particularly for young people. Researchers have therefore tried to disentangle the different influences on them, and the role of commercial promotion has come under particular scrutiny. In the case of tobacco, this research has had a significant impact on public policy.

For these reasons, it was felt that a brief review of the research on the promotion of tobacco and alcohol to young people would help inform the debate about the role that promotion may or may not play in children's food consumption.

Tobacco Promotion and Young People's Smoking

(a) Young People and Smoking

Smoking initiation typically occurs during teenage years, and increases rapidly during adolescence and early adulthood (Walker et al 2001), and there is evidence this tendency exists on a global scale (The World Bank 1999). These trends are worrying given the fact that people who start to smoke early in life are less likely to quit, are more likely to become heavy smokers and are at greater risk of suffering from cancer in later years (Doll & Peto 1981). This is set against a picture of one in two long-term smokers dying of their habit.

The role of tobacco promotion in the uptake and continuation of smoking behaviour has been the subject of great debate. A considerable amount of research has therefore been undertaken in an attempt to establish what effect, if any, promotion has on tobacco consumption, and to go some way towards settling this debate.

(b) The Literature on Promotion

Econometric studies, evaluations of the effectiveness of advertising bans and consumer studies have all been used to examine the effects of tobacco promotion on consumption. Econometric research has modelled changes over time in tobacco consumption with fluctuations in advertising spend. Adban studies have examined the impact of advertising bans by comparing smoking levels prior to and after their implementation. Consumer studies have focused on children and examined how they respond to tobacco promotion.

(i) Econometric Studies

The strongest evidence of a link between tobacco promotion and smoking comes from large scale econometric studies which have modelled the amount of advertising with the amount of smoking in a given jurisdiction. Cross-country analyses have drawn comparisons between countries with different advertising restrictions, while time-series studies have examined how variations in advertising expenditure, over time, influence tobacco consumption within a single country (MacFadyen & Hastings, in press). This research does provide evidence of a link (Hanewinkel & Pohl 1998) as a large majority of the studies undertaken report that advertising has a positive influence on the demand for tobacco products (MacFadyen & Hastings, in press). The studies show a distinct correlation between the phenomena even when other factors, such as price, are held constant.

There are a number of limitations to these econometric studies. First, when developing complex statistical models of the possible influences on consumption there is always a possibility that some factors may go unaccounted for in the model. Second, they tend only to examine advertising's effects and overlook other forms of promotion used by the tobacco industry. Third, as econometric analyses are based on behavioural measures of effect (ie. sales) they do not examine other important influences on smoking related knowledge and attitudes. Fourth, in most cases, they are unable to examine the effects on sub-groups of the population such as young people and low-income consumers.

(ii) Evaluations of Advertising Bans

Reliable evidence of a link comes from studies comparing levels of tobacco consumption prior to and after the introduction of an advertising ban (MacFadyen & Hastings, in press). Studies examining the effects of partial bans on advertising have found either only a very modest effect or no effect on demand (The World Bank 1999). More comprehensive advertising restrictions that cover the many forms of media harnessed by the tobacco industry have proved more effective in reducing consumption (Saffer & Chalouka 2000).

(iii) Consumer Studies

This research has been developed on the hypothesis that if tobacco advertising is reinforcing the habit amongst current smokers, then smoking children will be more aware and appreciative of it than non-smoking children; if it is encouraging uptake then this heightened awareness and appreciation should predate the onset of smoking. Studies have looked at each of these phenomena. In addition research has looked beyond advertising at branding and other promotional activity.

Awareness, appreciation and reinforcement. Many international consumer studies have shown that even very young children are aware and have a good recall of tobacco advertising (Aitken et al 1985, Aitken et al 1987, Charlton 1986, Fischer et al 1989, Fischer et al 1991, Di Franza et al 1991, Pierce et al 1991, Pollay et al 1996, Botvin et al 1993, Schooler et al 1996). This effect has been demonstrated in children as young as 3-6 years of age (Fisher et al 1991) who could see, understand, and remember tobacco advertising. A separate study by Di Franza and colleagues

(1991) showed that, children were more aware of tobacco advertising than adults.

Analysis by smoking status has shown that underage smokers are consistently more aware of and familiar with tobacco promotion than their non smokers peers (Aitken et al 1985, Aitken et al 1987, Fischer 1989, Di Franza et al 1991).

Studies have also shown that young smokers are more favourably oriented towards tobacco promotion than young non smokers. They have more positive attitudes to smoking (O'Connell et al 1981, Aitken et al 1986, Arnett & Terhanian 1998, Covell et al 1994, Pechman & Ratneshwar 1994, Di Franza et al 1991, Maziak et al 2003, Pierce et al 1991, Aitken & Eadie 1990, Potts et al 1986), are more likely than non smokers to have a 'favourite' tobacco advertisement (Charlton & Blair 1989, Aitken & Eadie 1990, Charlton 1986) and display a greater tendency to describe tobacco promotions in supportive terms (Aitken & Eadie 1990, Goddard 1990, Potts et al 1986).

This suggests young smokers are seeking out and getting some kind of benefit or reassurance about their habit from tobacco advertising, thereby reinforcing it (Hastings & Aitken 1995).

Predisposing effects. The possibility that tobacco promotion might also have a predisposing effect has been measured and demonstrated cross-sectionally by asking about future intentions to smoke (Evans et al 1995, Unger et al 1995) and more powerfully by using longitudinal designs to measure actual changes in both intentions and behaviour (Aitken et al 1991, Goddard 1990, While 1996, Alexander et al 1983).

Both approaches have shown that children's awareness and appreciation of tobacco promotion are important predictors of their future smoking. Non-smoking children who are particularly aware and appreciative of tobacco promotion are more likely to say that they intend to take up smoking in the future. The most convincing evidence of this comes from longitudinal cohort studies of advertising sensitivity and smoking behaviour where causal relationships between promotion and behaviour can be determined. For example, longitudinal research conducted in Scotland (Aitken et al 1991) showed that children with high levels of awareness and appreciation of tobacco promotion during the earlier phases of the research were more likely to develop an intention to smoke by the end of the study. Conversely, those who were less appreciative of tobacco promotion to start with, became less inclined to take up the habit. Another UK study found that girls who demonstrated greater awareness of cigarette promotion at the onset of the research were more likely to have taken up smoking at the two-year follow up stage (Goddard 1990). Similarly, longitudinal research undertaken in Australia (Alexander et al 1983) demonstrated that children showing greater levels of approval of tobacco promotion in a baseline survey were twice as likely to be smoking at the follow-up stage.

Importantly, the reinforcement and predisposing studies have all controlled for the other factors that are known to have an influence on smoking behaviour including social class, age, gender and peer/parental smoking (Hastings & Aitken 1995).

Influences on brand choice. Researchers have also explored the effects of tobacco promotion on young smokers brand choice. Studies conducted in the UK, the US and Australia have shown that underage smokers show a distinct preference for the most heavily promoted cigarette brands

(Aitken & Eadie 1990, Goddard 1990, Chapman & Fitzgerald 1982, Goldstein et al 1987, McNeill et al 1985, Aitken et al 1988c) and this tendency is more marked among child than adult smokers.

Other forms of tobacco promotion. In the last ten years a growing literature has explored the influence of other forms of tobacco promotion including sponsorship (Charlton et al 1997, Bates 1999), merchandising (Sargent et al 2000, Redmond 1999), brand stretching (CTCR 2001, MacFadyen et al 2001), product placement (Hart 1996, Chapman & Davis 1997), point of sale activity (Schooler et al 1996, Voorhees et al 1998), and loyalty schemes (MacFadyen et al 2001) on young people's smoking behaviour. These suggest that these alternate forms of promotion act much like advertising. Furthermore a large scale survey by MacFadyen et al (2001) shows that they operate cumulatively - as Narrative Review 1 predicts - with a dose response relationship emerging between young people's smoking and their involvement with the various forms of promotion.

(c) Summary

An extensive range of evidence now points to the conclusion that advertising does encourage smoking amongst the young. Econometric studies show that the overall amount of advertising correlates with levels of smoking. Studies of the impact of advertising bans show that forbidding cigarette advertising leads to a reduction in tobacco consumption. Studies of children show that cigarette advertising is getting through to them, that young smokers are more aware of, familiar with and appreciative of cigarette advertising than are their non-smoking peers, and that their awareness of cigarette advertising predicts the uptake of smoking. In each of these types of study other dependent variables have been appropriately controlled.

More recent research has shown that these findings also apply to non advertising forms of promotion.

Alcohol Promotion and Young People's Drinking Behaviour

(a) Young People and Alcohol

As with tobacco, there are public health concerns about young people's consumption of alcohol. However in this case the concern is not only a long term health one, but the short term consequences of intoxication – including risk taking behaviour, accidents, violence, anti-social behaviour and alcohol poisoning. These are nonetheless serious issues; WHO estimate that one in four deaths among men under 30 in Europe is directly attributable to alcohol (World Health Organization 2000).

Three related phenomena have raised questions about the impact that alcohol promotion may be having. First, thanks to the expansion and development of the promotional mix, alcohol marketers can use a variety of media to promote their products. The promotion of alcoholic drinks has expanded beyond the conventional channels of billboards, press and television (Cooke et al 2002) into interactive media such as the internet and mobile phones (incorporating so called 'viral marketing'). These changes have been matched by innovations in new product development, with designer drinks, alcopops and premixed cocktails all appearing on the market. Second, research

demonstrating that young people are extremely active consumers of a wide variety of media (particularly emerging digital forms of communication) suggests that it is becoming increasingly difficult to 'shield' them from the promotion of products that they are not yet old enough to purchase or consume. Third, survey research with young people demonstrating worrying increases in their consumption of alcohol has made clear the need to fully investigate the underlying motivations behind such behaviours. One possible influence is that of industry promotion, and there is now a growing body of literature examining the role of alcohol promotion in the consumption behaviour of young people.

This research literature has covered similar ground as that for tobacco, but is less well developed. Econometric studies have been conducted to look for population level effects. For the most part these have not been found. However, as with tobacco, they would, in any case, tell us little about the effect, if any, of promotion on young people. This requires consumer surveys; key findings from these studies are now briefly presented.

(b) The Literature on Promotion

Consumer studies undertaken with young people have demonstrated a link between alcohol promotion and drinking. A co-relational survey undertaken with 772 young people in the US (Strickland 1984) found that advertising had a small but significant impact on alcohol consumption (particularly when compared with peer influence). However young people's exposure to alcohol promotion was extrapolated from reported television viewing weighted for the amount of beer and wine adverts featured during the programming. Another co-relationship survey (Atkin et al 1984) used direct measures of advertising exposure instead, and demonstrated a significant relationship between this and current alcohol consumption. The study also included an element of predictive effect, as non-drinking youths that were more exposed to alcohol advertising displayed greater intentions to drink later in life. The authors discuss the difficulties of establishing the direction of causality, but argue that the association does reflect advertising influence.

Similarly, Grube & Wallack (1994) examined the relationship between young people's awareness of alcohol advertising and knowledge of alcohol brands, beliefs about drinking, and intentions to drink as adults. 468 young people from North California participated in surveys and face-to-face interviews. The study found that young people who were more aware of alcohol advertising demonstrated greater knowledge of beer brands, had attitudes that were more favourable towards drinking, and reported greater intentions to drink later in life (Grube & Wallack 1994).

A qualitative study carried out in the UK looked in detail at 10 to 16 year old's perceptions of, and responses to alcohol advertisements (Aitken et al 1988a). The researchers found that familiarity with, and appreciation of, alcohol advertisements increases rapidly between 10 and 14, and 15-16 year olds enjoy and are very adept at deducing complex symbolism and imagery (such as masculinity, sociability and working class values) from them. Similar results are reported in a quantitative study by Austin and Knaus (2000). Aitken et al (1988) conclude that many of the characteristics of alcohol adverts which are designed to attract young adults are also highly appealing to young teenagers.

The same research team went on to conduct a cross sectional survey of 433 10-17 year olds (Aitken et al 1988b, 1989). This confirmed that children are very aware of television alcohol advertising, that they find it appealing and that as they get older, are increasingly adept at deducing complex imagery from it. The study also revealed distinct differences between under-age drinkers and non-drinkers: the former enjoy alcohol advertising more and are significantly better at recognising the brand imagery contained within it. Furthermore these differences are independent of other variables known to be associated with underage drinking (such as age, and peer and parental alcohol consumption) and variables that might explain an attraction to television advertising.

This still leaves the issue of causality: does drinking encourage attention to advertising or advertising encourage attention drink? Aitken et al by argue that their data show that young drinkers are paying more attention to alcohol advertising and, according to advertising theory, this means they must be getting some reward or benefit from it. In particular they are deriving greater benefits from it than their non-drinking peers, and, as all other variables are being held constant, the only possible explanation is that these benefits relate to their alcohol consumption. In short, the advertising is rewarding and reinforcing their drinking.

Wyllie et al (1998a,b) conducted a similar cross sectional survey with both 10 to 17 and 18 to 29 year-olds, collecting data on awareness and liking of alcohol advertising and drinking behaviour and expectations. In both cases, structural equation models were used to interpret the data, with the findings suggesting: "...tentative support for the theory-based hypothesis that positive responses to beer advertisements increased the frequency of current drinking and expected future drinking." (Wyllie et al 1998a, abstract). Neither study provided any support for the reciprocal hypothesis – that drinking might generate positive attitudes to alcohol advertising.

Longitudinal studies have also been conducted to focus further whether or not there is a predictive relationship between advertising and drinking. Much of the work of this area has been conducted in New Zealand. One study (Connolly et al 1994) recorded young New Zealander's recall of alcohol promotions, television viewing habits, drinking behaviour and other factors such as peer's alcohol related-beliefs. Beer advertising was the most commonly recalled form of advertising among 15 year olds. Males in the sample who recalled more alcohol advertising at 15 years of age consumed more beer at 18 years.

The link between liking for alcohol advertising, brand loyalty and alcohol consumption was examined in another longitudinal study (Casswell & Zhang 1998) undertaken with 603 New-Zealanders. Liking for alcohol advertising at 18 years of age did not influence the amount of beer consumed at the same age, although tendencies towards particular beer brands at this age did appear to have an affect on the amount of beer consumed. Both liking for alcohol advertising and brand loyalty towards a particular brand of beer at age 18 were shown to significantly influence the amount of beer consumed at age 21.

(c) Summary

Overall, these studies – especially the more sophisticated recent ones – do suggest a link between advertising and young people's drinking. In essence, the more aware, familiar and appreciative

young people are of alcohol advertising; the more likely they are to drink both now and in the future. However, they also begin to reveal the complexity of the issue, with the interaction of consumer choice, advertising effect and marketing opportunism creating powerful dynamics. The studies on branding also begin to force the agenda beyond advertising

4. Implications for the Food Standards Agency Review

Three lessons emerge from the tobacco and alcohol literature for the Food Standards Agency review. First, it confirms that disentangling the influences on complex human behaviours is extremely difficult. There will never be any such thing as certainty or final proof. Evidence has to be collected and conclusions drawn on the basis of a balance of probabilities. In the case of tobacco, UK policy makers have decided that the case is strong enough and appropriate policy has been developed. This is not so with alcohol, where the debate continues.

Second, looking for effects with population sub-groups like children requires consumer studies. Econometric, population based approaches will not provide a sufficient degree of disaggregation.

Third, it shows that researchers tend to focus on advertising, but that other promotional activity, and the cumulative effect this has, also needs to be considered.

PART 2

Systematic Reviews

Research Questions

Systematic Review Methods

Review Results: Systematic Review 1: The Extent and Nature of Food
Promotion to Children

Review Results: Systematic Review 2: The Effects of Food Promotion on
Children's Food Knowledge, Attitudes and Behaviour

Conclusions and Recommendations for Future Research

Research Questions

The systematic reviews presented in Part 2 examined the extent and nature of food promotion to children and its effects on their food knowledge, preferences and behaviour. The following specific research questions were examined in each review.

Systematic Review 1: The Extent and Nature of Food Promotion to Children

Q1: (1) What promotional channels are being used to target children?

Q1: (2) What is the relative spend in each of these promotional channels?

Q1: (3) What are the time trend changes?

These questions sought to gauge the extent of food promotion to children in terms of the range and diversity of promotional channels used to reach children. Spend data were examined to assess the relative usage of different channels, and time trend changes were examined to investigate any variance in the use of different channels over time.

Q2: (1) What food items are being promoted to children?

Q2: (2) What are the time trend changes?

These questions examined the nature of food promotion to children in terms of the type and range of food items promoted. Spend data were examined to assess any variance in the range of foods promoted over time.

Q3: (1) What are the principal creative strategies used to target children?

Q3: (2) To what extent are these different creative strategies being used?

Q3: (3) What are the time trend changes?

As identified in the first narrative review, marketers have developed creative strategies and techniques that have particular appeal to children. The first question sought to identify the key creative strategies used by food marketers (for example, the use of animation or humour) when promoting their products to children. The second sought to quantify the extent to which the different creative strategies are used. Time trend changes were examined to assess whether usage of different creative strategies has varied over time.

Systematic Review 2: The Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour

Q1 How do children respond to food promotion?

This question examined children's responses to food promotion (for example, recall of food promotion, liking for and attitudes towards food promotion, purchase request behaviour and response to packaging). This question was not concerned with causality, rather with examining the possible ways in which children respond to and interact with promotion.

Q2 Is there a causal link between food promotion and children's food knowledge, preferences and behaviour?

Q2:(1) Does food promotion influence children's nutritional knowledge?

Q2:(2) Does food promotion influence children's food attitudes and preferences?

Q2:(3) Does food promotion influence children's food consumption behaviour?

Q2:(4) Does food promotion influence children's food purchase-related behaviour?

Q2:(5) Does food promotion influence children's diet?

Q2:(6) Other effects of food promotion

These questions sought to investigate the nature of the relationship that may exist between food promotion and children's food knowledge, preferences and behaviour. Specifically, they sought to establish whether the relationship between exposure to food promotion and the proposed effect (if any) is causal or not.

For the purpose of the review, food *knowledge* was defined as including general perceptions of 'good' and 'bad' foods, perceptions and understanding of a balanced diet, perceptions and knowledge of the nutritional value of different foods, the ability to understand the composition of processed foods, and understanding of nutritional concepts. Food *preferences* were defined as including both liking for specific foods and preferences between different foods. Food *behaviour* was defined broadly, as including purchasing and purchase-related behaviour, consumption behaviour, and diet and health status.

Q3 If food promotion is shown to have an effect on children's food knowledge, preferences and behaviour, what is the extent of this influence relative to other factors?

This question sought to assess the extent of food promotion's influence in relation to other factors assumed to influence children's food knowledge, preferences and behaviour. Only studies which examined the influence of food promotion and at least one other assumed food choice factor were judged capable of addressing this question.

Q4 In the studies which demonstrate an effect of food promotion on children's food knowledge, preferences and behaviour, does this affect total category sales, brand switching or both?

This question addressed the issue of 'brand-switching' and investigated whether food promotion encourages children to prefer, buy or consume food products in different categories or simply stimulates their interest in particular food brands.

Systematic Review Methods

This section of the report provides details of the methods used to search for, identify and assess evidence for both Systematic Reviews.

The Review Team

The Systematic Review team comprised researchers at the Centre for Social Marketing at the University of Strathclyde in Glasgow, in close collaboration with research partners based at the Department of Public Health at the University of Oxford, the Department of Health Sciences and Centre for Health Economics at the University of York, and the Department of Health Management and Food Policy at City University, London. The contributions of members of the review team were as follows:

- Gerard Hastings led the project and co-ordinated the efforts of all of the research partners. In addition he managed the development of the review methodology and guided the review, analysis and synthesis of evidence for the Systematic Reviews.
- Laura McDermott was responsible for protocol development, literature retrieval, initial relevance screening and the write-up of the review methods. She was supported by Kathryn Angus who also undertook searches of electronic databases and the retrieval of relevant literature.
- Martine Stead was lead author on the Systematic Review of the effects of food promotion on children's knowledge, preferences and behaviour. She was responsible for second-stage relevance and quality assessment of studies and data extraction. In addition, she contributed to the development of the review methods and acted as a second reviewer for initial relevance.
- Alasdair Forsyth was lead author on the Systematic Review of the extent and nature of food promotion to children. He was responsible for second-stage relevance and quality assessment of studies, and data extraction.
- Mike Rayner, Anne-Marie MacKintosh and Christine Godfrey participated in team meetings, reviewed for second stage quality and relevance, and contributed to the analysis and write-up of studies for the second Systematic Review.
- Martin Caraher contributed to the development of the review methodology and participated in team meetings.

Strategy Development

The review methods required careful planning and were developed and refined through various stages of consultation and review. Relevant sources were consulted to ensure that the methods were developed in accordance with accepted standards for systematic literature reviews. Principal references included the healthcare effectiveness literature (where the concept of the systematic review originated and has been most heavily applied) and manuals produced by the Cochrane Collaboration (Clarke & Oxman 2003) and the Centre for Reviews and Dissemination (CRD) (Khan et al 2001).

The first step involved developing a protocol which set out the methods to be followed by the review. To produce the protocol, key methodological decisions were made in advance concerning the review questions, the search strategy and study selection criteria and procedures. The protocol was developed through meetings among the review team and consultations with the Business Information Specialist at Strathclyde University Library. The specialist was able to provide valuable information on the range, accessibility, and quality of sources available to the review team.

A copy of the review protocol is contained in Appendix 1: Sample of Review Protocol.

Search Methodology

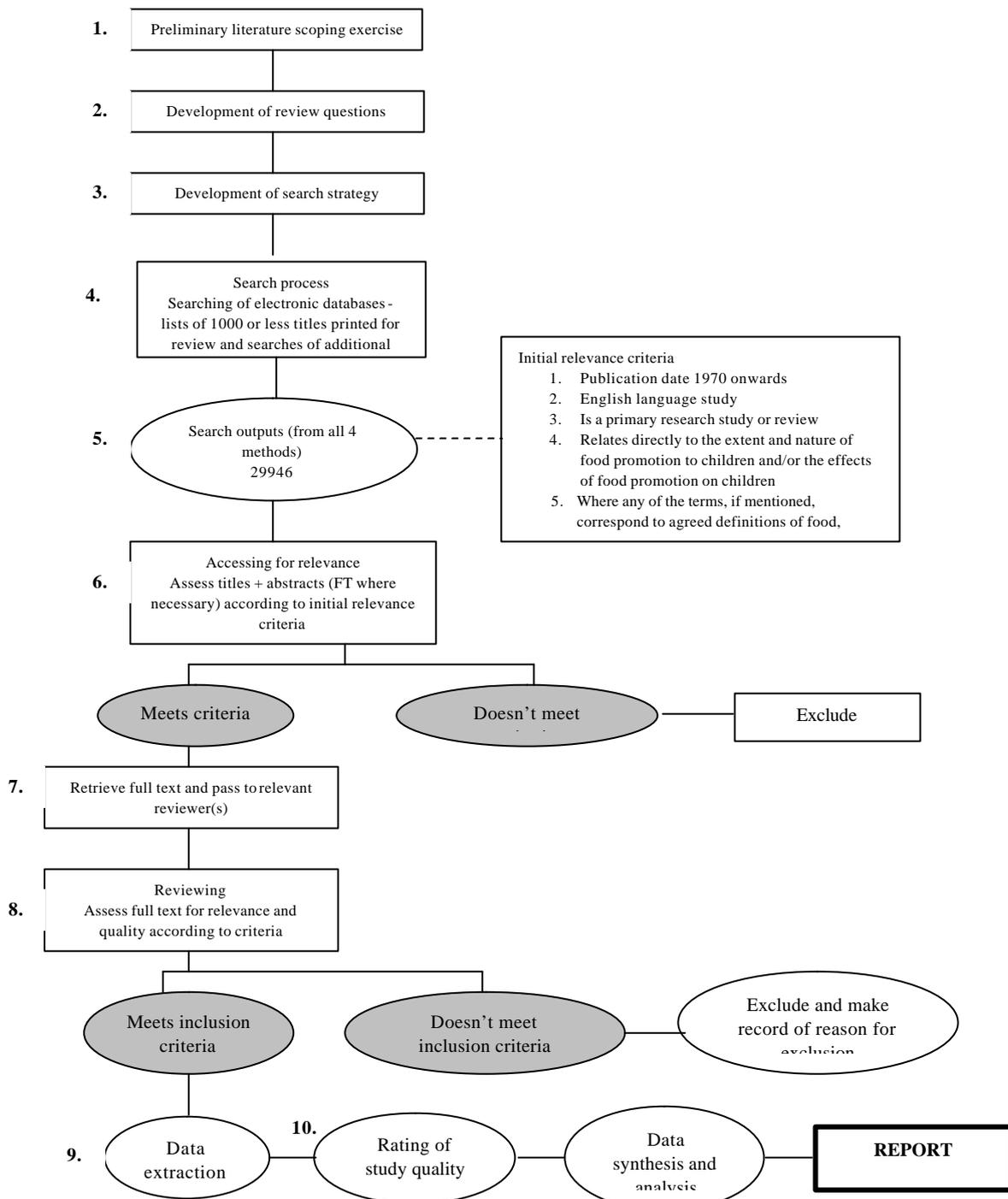
The generic framework for undertaking systematic reviews was fairly easily adapted for the current reviews. The process involved several key stages (see Figure 1). Initially (1) a preliminary search of the literature was undertaken to inform (2) the development of the review questions and (3) the search strategy. Searches of the identified sources were then undertaken during (4) the search process and (5) the search outputs generated by each source were carefully documented. The references identified by the searches then underwent (6) an initial stage of relevance assessment. Articles that passed this initial phase of assessment were (7) retrieved in full text and passed to the relevant reviewers. These articles then underwent a second phase of relevance assessment and were also evaluated in terms of methodological quality during (8) the reviewing process. Studies that passed this stage were *included* in the review and first underwent (9) data extraction followed by (10) rating of study quality. Each stage is now described in more detail.

(1) Preliminary Literature Scoping Exercise

A preliminary search of the academic literature was undertaken during the early stages to aid the development of the review protocol and provide information on the potential nature, size and quality of the evidence base. Filtered searches for existing reviews and primary studies were undertaken on a small sample of relevant electronic databases including ABI/INFORM and PsycINFO. These searches were undertaken by two members of the review team with advice and assistance from the Business Information Specialist at Strathclyde University Library.

The preliminary search served a number of useful purposes. First, it provided an early indication of the potential size and nature of the evidence base: that there was a manageable amount of literature on this subject that was fairly heterogeneous in terms of methodological design. This information was particularly useful in informing the development of the review questions. Second, the process

enabled the reviewers to become familiar with search procedures and the interfaces of different databases. This provided more pragmatic guidance in terms of planning and scheduling how and when searches would be undertaken.

Figure 1: Overview of Review Methods

(2) Review Questions

The literature scoping exercise informed the development of research questions for each of the systematic reviews. These questions are listed on pages 48 and 49.

(3) Development of the Search Strategy and (4) the Search Process

Overview of Methods Used

In the interests of efficiency, a single search strategy was developed to capture literature relevant to both Systematic Reviews. The search strategy set out details of the databases and other sources to be searched, together with the search terms. Three main methods were used to identify potentially relevant research: (i) an extensive search of electronic databases; (ii) searches of the ‘grey’ literature; and (iii) personal contact with key people in the field. In addition, (iv) reference chasing from a sample of included studies was conducted, and an ‘in-house’ search for relevant literature undertaken.

(i) Electronic Databases

Selection of Databases. The primary source for relevant literature was electronic databases. On advice, a decision was taken not to hand-search journals, given the time-constraints of the project and the potential for human error. Instead, the strategy was developed to maximise the potential from electronic sources.

Eleven databases, representative of the relevant literatures (eg. psychology, marketing, nutrition, economics) and accessible to the review team, were identified for systematic searching. Despite the potential for some overlap in the coverage of different databases, searches were undertaken on them all, for two key reasons. First, the reviewers were keen to adopt a ‘broad’ approach. This was the first UK systematic review of the literature in this field and guidance on the most useful sources was limited. Identifying the more effective elements of this broader strategy could help inform future work in this area. Second, consulting a wide range of databases would help to minimise the potential effects of database bias (eg. geographic biases). Figure 2 provides details of the consulted databases and their typical content.

Selection of Search Terms. A list of terms and phrases to search the databases was then compiled. A sample of the databases were visited (ABI/INFORM, PsycINFO and OmniFile) and the subject indexes explored to gauge the relevant terminology being used to describe research in this area. The key terms ‘children’, ‘food’ and ‘marketing’ were used at this stage as they represented three important components of the research problem: the population under study (ie. children), the product of interest (ie. food) and the potential source of influence (ie. marketing). ‘Marketing’ was chosen over ‘promotion’ as the preliminary searches identified it as a more common and relevant indexing term.

This process produced a master list of 30 search terms and phrases (see Appendix 2: Master List of Search Terms). Many of these terms were fairly broad (for example, advertising, consumer behaviour, brands) and therefore likely to produce many irrelevant references as well as relevant ones. To account for this, more specific and relevant combinations of the terms and phrases were created and added to the list. The final list therefore consisted of searches across three levels of specificity: broad terms (ie. the individual terms/phrases), narrow terms (ie. combinations of children or food with key marketing terms or phrases) and very narrow terms (ie. combinations of children and food with key marketing terms or phrases).

Figure 2: Consulted Electronic Databases

Database	Description of Database	Example of Typical Content
ABI/INFORM	Database of worldwide business information	Journal of Advertising Research, Journal of Consumer Affairs, Journal of Consumer Research, Journal of International Economics, Journal of Marketing, Journal of the Academy of Marketing Science, American Journal of Public Health, Journal of Public Policy and Marketing,
Business & Industry	Broad-based international business information database	Marketing Week, Advertising Age, Campaign
Emerald	Management, library and information services journals	British Food Journal, European Journal of Marketing, Nutrition and Food Science, Journal of Consumer Marketing, International Journal of Social Economics, Marketing Intelligence & Planning
Eric	Database of educational research	Ad-hoc Government Reports and Publications, Books, Family and Consumer Sciences Research Journal, Journal of Communication, Journal of Consumer Education, Educational Leadership, Sex Roles
IBSS (BIDS)	International bibliography of social science research	British Journal of Nutrition, Journal of Child Psychology and Psychiatry, Journal of Health Economics, Journal of Media Economics, Applied Economics, Nutrition Research
Ingenta	Global research gateway	American Journal of Health Studies, Australian Journal of Nutrition and Dietetics, British Food Journal, Community Dental Health, Current Issues in Research & Advertising, Health Education Research, Journal of Adolescent Research, Journal of Applied Social Psychology, Journal of Food Products Marketing, Journal of the American Dietetic Association, Nutrition Reviews, The Journal of Psychology
Social Science Citation Index	Multidisciplinary database covering the journal literature of the social sciences	American Journal of Health Behavior, Australian and New Zealand Journal of Public Health, Canadian Journal of Public Health, Communications, Community Health Studies, Developmental Psychology, FASEB Journal, International Journal of Obesity, Pediatrics, Journal of Advertising
Science Citation Index	Multidisciplinary database covering the journal literature of the sciences	Appetite, Archives of Pediatrics and Adolescent Medicine, Ecology of Food & Nutrition, Journal of Food and Nutrition, Journal of Dentistry, Journal of Nutrition Education, Journal of Human Nutrition and Dietetics, Proceedings of the Nutrition Society
OmniFile	Multidisciplinary, 100 % full-text database covering journal articles and book reviews	The Education Digest, The Journal of School Health, Journal of Advertising
PsycINFO	Database of psychological abstracts	Child Development, Children's Health Care, Dissertation Abstracts International, Journal of Applied Developmental Psychology, Health Education Quarterly, Hispanic Journal of Behavioral Science, Journal of Broadcasting and Electronic Media, Journal of Clinical Child Psychology, Journal of Developmental and Behavioral Pediatrics
Sociological Abstracts	Multidisciplinary full text database, with a strong focus on social science research	The American Journal of Economics and Sociology, Child Development, Journal of Consumer Research

Searches were undertaken on each database across all levels of specificity. Although it was anticipated that this was likely to produce many duplicate 'hits', it would account for the variability in the quality of indexing across different databases (as different terms, phrases and word combinations

may prove more or less useful in different databases). If necessary, the team could later assess the outputs produced by this extensive strategy and select the more useful and relevant reference lists for review.

Searching. Indexed searches, or the nearest equivalent, as presented in Figure 3, were undertaken on each of the identified databases. The electronic library of the Cochrane Collaboration, an electronic resource comprising seven databases centred on the effectiveness of interventions in health care, was also searched. The interface of the Cochrane Library differs from the others in that one single function allows the user to search all the databases at one time and, as such, a different search strategy was used for this resource. One of the seven databases within the Cochrane Library is The Cochrane Database of Systematic Reviews; no other systematic reviews on the promotion of food to children were found. For specific details of the search strategy employed for each database, see Appendix 3: Search Strategies for Electronic Databases.

Figure 3: Databases and Search Fields

Database	Search Field
ABI/INFORM	Subject
Business & Industry	Title + anywhere
Emerald	Keywords
Eric	Keywords
IBSS (BIDS)	Title, keywords and abstract
Ingenta	Title, keywords and abstract
Social Science Citation Index	Topic
Science Citation Index	Topic
OmniFile	Subject
PsycINFO	Subject
Sociological Abstracts	Keywords

Details of every search were carefully documented to provide a transparent and replicable record of the review process. A full record was made of every search undertaken including the date of the search, the search term or phrase used, the search field in which the term or phrase was used, any applied limits and details of the search output (ie. the number of hits generated by each search).

For every search that returned 1000 or less references, a list was printed for review. Where the facilities of a database permitted, both titles and abstracts were obtained in printed form. Searches that produced +1000 references were *not* printed and were therefore *not* included for review. This restriction was applied in the interests of manageability and to ensure that search lists containing a considerable number of potentially *irrelevant* references were minimised.

An electronic search ‘journal’ was also kept to record specific information about the facilities of individual databases (eg. the time-span coverage of each database, the range of possible search fields) and details of the researchers’ experiences including, for example, any problems encountered.

(ii) Search of Grey Literature

In addition to searching electronic databases, the reviewers also searched ‘grey’ literature (literature not published through formal academic channels). Three sources were consulted: bibliographies, Regard and market intelligence.

Bibliographies. Three bibliographies were identified and consulted for both UK and international studies: those held by the National Food Alliance/Sustain and the Advertising Association (UK), and the Food, Alcohol and Tobacco Marketing Bibliography. The reviewers were primarily interested in ‘grey’ research not likely to have been picked up by the searches of electronic databases. However, as these lists also contained details of some key academic research, the process also served as a useful ‘reality check’ to ensure that the electronic searches had generated the required type and range of relevant research. Figure 4 outlines the search strategy for each bibliography.

Figure 4: Bibliography and Search Strategies

Source of Grey Literature	Description of Search Strategy
National Food Alliance/Sustain	Sustain (previously the National Food Alliance) is a UK-based consumer organisation that has produced research relevant to the topic under study. The publications list on the organisation’s campaign document was searched in order to identify research undertaken, by this group and others, considered relevant to the current project.
Advertising Association (UK)	The UK’s Advertising Association is an organisation with great interest in this field of research. Reference lists of relevant publications were downloaded from the website (http://www.fau.org.uk/reading.html and http://www.adassoc.org.uk/inform/childads.html) during July 2002. These lists were searched for research directly relevant to either or both of the systematic reviews.
Food, Alcohol and Tobacco Marketing Bibliography	This extensive bibliography of research and writing on the ‘Marketing of Food, Alcohol and Tobacco to Young People’ was produced by the International Obesity Task Force in April 2002. The bibliography was downloaded from http://www.iotf.org.php.fatbiblio.htm . The bibliography contains details of both UK and International academic and grey literature. References listed in the section on ‘Marketing of Food to Young People’ were searched for research potentially relevant to the systematic reviews.

Regard. The researchers also consulted Regard, an online electronic database of social science research funded by the Economic and Social Research Council (ESRC). The database contains records of ESRC funded research projects dating back to the mid-1980s and their associated outputs (eg. journal articles, books, etc). The search strategy for Regard is listed with those of the other electronic databases in Appendix 3: Search Strategies of Electronic Databases.

Market Intelligence. Market intelligence sources were also consulted in order to track advertising spend data capable of addressing the research questions for Systematic Review 1: The Extent and Nature of Food Promotion to Children. The report listings of Mintel, Key Note and Reuters Business Insight (consumer goods reports only) were searched for reports that were specific to food and children and were capable of addressing the relevant review questions.

Two consumer goods reports produced by Reuters were considered relevant and were retrieved by the review team. Many of the reports produced by both Mintel and Key Note were highly specialist (concentrating on a given market or product, or a particular group of consumers, for example), and contained only a small amount of fragmented data capable of addressing the review questions. In light of this, the reviewers contacted AC Nielsen in the UK, a market research company specialising in tracking advertising spend, and requested the production of an ad hoc report on food promotion

expenditure, tailored to suit the requirements of the review questions. A breakdown of advertising spend by food brand and promotional channel was obtained for the years 1994, 1998 and 2002. This enabled comparisons to be drawn between different food categories and brands, and different promotional media. As data were obtained for different years, a time trend analysis could also be undertaken.

(iii) Personal Contact

Personal contact was made with key academics in an attempt to identify unpublished studies. Publications obtained through personal contact are listed in Appendix 4: References Obtained through Personal Contact.

(iv) Reference Chasing and In-house Literature

The reference list of the original MAFF review (Young et al 1996) was also examined to identify any studies not retrieved through other search methods.

Due to the time constraints of the project, it was not feasible to examine the reference lists of all studies included in the review in order to retrieve further relevant research. Therefore, the reference lists of a 15% sample of included studies were examined as a means of assessing how successful the search strategy had been. Full details of the outcome of this are provided in Appendix 5: Outcomes of Reference Chasing Exercise.

Finally, an in-house search of the literature stored at CSM was undertaken to identify any studies not retrieved through other search methods. For a list of studies identified through these means see Appendix 6: References Found In-House.

Preliminary Assessment of Search Outputs

Because the search of electronic databases was so extensive, it produced an extremely large number of printed references. In the interests of manageability and efficiency, the review team selected the most relevant lists for review.

First, a decision was made not to review all of the reference lists produced by the broader individual-term searches as they were more likely to contain large numbers of irrelevant studies and duplicates of studies already picked up by the narrower combination-term searches. The combination-term searches were more specific, but were judged to be still comprehensive enough to have picked up the relevant studies contained in each database. As a consistency check, a representative sample (12%) of individual-term reference lists were reviewed. These were searches using the terms 'food', 'food advertising', 'children', and 'promotion' that produced less than 1000 references. The reference lists produced by searches using these terms were chosen because prior analyses of the combination-term reference lists found them to be particularly useful in identifying directly relevant studies (although the term 'promotion' was less useful in certain databases). The review of these individual-term reference lists confirmed that the narrower searches had been effective in identifying relevant research as the process did not identify any relevant studies that had not already been picked up by the narrower searches.

Both combination-term and individual-term reference lists that were reviewed are highlighted in bold in Appendix 3: Search Strategies for Electronic Databases.

A decision was also made not to review the reference lists produced by searches of the Business and Industry database, as this retrieved a large number of editorial, opinion and journalistic pieces.

(5) Search Outputs

These methods produced a total yield of 29946 references (see Figure 5).

Figure 5: Total Yield of References by Source

	Electronic databases	Grey searches	Personal contact	Reference chasing	TOTAL
Yield	29784	56	5	101	29946

The search of electronic databases yielded 29784 references, while the search of grey literature sources yielded 56 references. Personal contact with key researchers in the field identified a further five studies of potential relevance. Examining the bibliography of the original MAFF review (Young et al 1996) and the in-house search yielded a further 101 potentially relevant references.

The number of potentially relevant references generated through the searches is clearly sizeable. This is accounted for in part by the degree of overlap (in terms of duplicate studies), both across searches of different databases and across searches within databases, which was greater than originally expected. Due to the similar nature of some of the search terms and phrases that were applied (eg. advertising, advertisements, advertising media) a large number of duplicates were identified. Furthermore, it became clear that some of the original search terms and phrases were considerably less useful than others even when used in combination with other terms (eg. consumer behaviour, consumer surveys).

(6) Initial Stage of Relevance Assessment

Initial Relevance Criteria

All of the references identified through the search methods underwent an initial stage of relevance assessment. Initial relevance criteria were developed in order to filter out directly relevant studies. These are described in Figure 6 below.

Figure 6: Initial Relevance Criteria

1. Publication date 1970 onwards.
2. English-language study.
3. Is a primary study or a review.
<p>4. Relates directly to the extent and nature of food promotion to children, or to the effects of food promotion on children's food knowledge, preferences and behaviour.</p> <p>Studies considered relevant to Systematic Review 1:</p> <ul style="list-style-type: none"> • Studies of the extent and/or nature of <i>food promotion</i> to children, including content analysis studies • Studies of the extent and/or nature of <i>promotion</i> (more generally) to children, including content analysis studies • Studies of the extent and/or nature of <i>food promotion</i> to adults, including content analysis studies, where 'children' is mentioned in the abstract • Reviews of the extent and nature of food promotion/promotion to children <p>Studies considered relevant to Systematic Review 2:</p> <ul style="list-style-type: none"> • Studies of the effects of <i>food promotion</i> to children • Studies of the effects of <i>promotion</i> (more generally) to children where 'food' is mentioned in the abstract • Studies of influences on children's food knowledge, preferences and behaviour where 'promotion' is mentioned in the abstract • Reviews of the effects of food promotion to children
<p>5. Where any of the terms, if mentioned, correspond to the following agreed definitions:</p> <ol style="list-style-type: none"> a. Children - those between the ages of 2-15 years b. Promotion – includes advertising (television, cinema, radio print), internet, packaging and labelling, branding, point-of-sale material, merchandising, film and television programme tie-in characters, and the commercial sponsorship of education material, by a commercial source c. Food – both food and non-alcoholic drinks, but excludes food supplements, vitamins and infant formula d. Food knowledge, preferences and behaviour - food knowledge was defined to include perceptions of 'good' and 'bad' foods, perceptions/understanding of a balanced diet, perception/knowledge of the nutritional value of foods, understanding of the composition of foods, and understanding of nutritional concepts. Food preferences was defined to include liking for specific foods and preferences between different foods. Food behaviour was defined to include food purchasing behaviour, food purchase-related behaviour, food consumption behaviour and diet and health status.

The initial relevance criteria were developed to help identify studies potentially capable of addressing the review questions and therefore eligible for further assessment. To progress to a further stage of relevance and quality assessment, studies were required to meet all of the above stated criteria.

As shown in Figure 6, studies had to be published in or after 1970 and in English to meet the criteria. The review was particularly interested in UK evidence and research from culturally similar English-speaking countries such as the US, Canada and Australia. Studies conducted in typically non-English speaking countries *could* be included, provided that they were published in English. Only primary research studies or reviews were eligible for inclusion: opinion and editorial pieces were excluded.

For Systematic Review 1: The Extent and Nature of Food Promotion to Children, studies of the extent and nature of *food promotion* and, more generally, of *promotion* to children (even if the focus of the study was not on food) were considered relevant. More general analyses of *promotion* to children were included on the assumption that they may contain some more specific analysis of food promotion, on which an assessment of relevance could be made at a later stage. Studies of the extent and nature of *food promotion* to adults were only considered if they mentioned 'children' in the abstract.

For Systematic Review 2: The Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour, studies of any design that examined the effects of *food promotion* to children were considered relevant. Studies looking at the effects of *promotion* more generally (i.e. not specific to food) were *not* considered relevant unless they mentioned 'food' in the abstract.

To address the issue of the *relative* influence of food promotion, the review only considered studies of influence that mentioned 'promotion' in the abstract. Only studies which examined the influence of food promotion and at least one other assumed food choice factor were judged capable of addressing this question.

Assessing for Initial Relevance

The printed lists of references and abstracts obtained through the database searches were manually examined for studies meeting these criteria. Two members of the review team independently undertook this assessment. To test for consistency in the application of the criteria, a representative 10% sample of the reference lists was also independently reviewed by a researcher at CSM who was not directly involved with the project. Reviewer consistency in this respect was found to be 100%.

References identified through the other search methods (grey searches, personal contact and reference chasing) were assessed initially for relevance on the basis of the title alone (as that was often all that was available). A proper assessment of these studies according to the initial relevance criteria was often made once a full text copy had arrived 'in-house.'

Totals of the number of studies meeting the initial relevance criteria for each of the systematic reviews that arrived prior to the cut-off date of 16 June 2003 are provided in Figure 7 below. It should be noted these figures do not include a further 24 articles which were identified and either arrived after the cut-off date and met the initial relevance criteria for the review, or whose retrieval was still pending at the time of report writing. These articles were not included in the review (see Appendix 7: List of Late Arriving Articles).

Figure 7: Studies Meeting Initial Relevance Criteria

	Electronic databases	Grey literature search	Personal contact	Reference chasing	TOTAL
No. of studies that met the initial relevance criteria for Systematic Review 1	60	9	3	7	79
No. of studies that met the initial relevance criteria for Systematic Review 2	87	9	2	11	109
No. of studies that met the initial relevance criteria for both SR1 and SR2	6	5	0	2	13
TOTAL	153	23	5	20	201

Note: any articles identified through electronic database searches and another search method are included only in the electronic database figures.

(7) Retrieval of Full Text of Relevant Studies

The full citation for each article that met the initial relevance criteria for the systematic reviews ($n=201$) was entered into a 'review database' and sourced to identify the most efficient and cost-effective means of retrieval. In most cases, local libraries were consulted in the first instance in order to ascertain if they held a copy of the relevant article. Where studies were not available locally, an application to obtain the study through inter-library loan was made. When a full-text copy arrived in house, a record was made in the review database that the study had been retrieved and the article was passed to the lead author on the relevant systematic review.

(8) The Reviewing Process

Systematic Review 1: Review of the Extent and Nature of Food Promotion to Children

The searches retrieved 92 articles which were judged on the basis of their abstracts to be potentially relevant to Systematic Review 1. These articles were read to ascertain firstly that they were indeed primary research studies, as opposed to opinion pieces. Reviews were *excluded* at this stage unless they either presented unique data on the extent and nature of food promotions to children or made original comparisons with data published in other articles. This excluded four studies (Goldstein 1992, Meringoff 1980, Sharma 1995, Sheikh et al 1974).

The remaining 88 articles underwent a three-stage assessment. On the first stage of the assessment each article was examined on a specific set of relevance criteria and those not meeting these criteria were excluded:

- For inclusion, each article had to report on the nature and extent of food promotion to children. Three articles measured aspects of food promotion to children (eg. attitudes towards) without reporting the extent and nature of this promotion, and were excluded on

this basis (Foulds 2001, Levine & Gussow 1999, Young & Hetherington 1996). Similarly, 14 articles were excluded as they did not adequately separate food from other items promoted to children (Biltreyst 1997, Blackwell & Yawkey 1975, Browne 1998, Bush et al 1983, Feldstein & Feldstein 1982, Furnham et al 1997, Klobe 1990, Leslie 1992, Loughlin & Desmond 1981, Ruble et al 1981, Schwartz & Markham 1985, Smith 1994, Sobieraj 1998, Stout et al 1988).

Secondly, the methodology reported in each of the remaining 71 articles was assessed according to basic methodological criteria:

- Information about study design, sampling, data collection, coding and analysis had to be included. Six articles were excluded on this basis (Greenberg & Brand 1993, Most & Windhauser 2002, Richards et al 1998, Strasburger 1995, Windhauser & Windhauser 1993 and 1994).
- Articles where adequate information on how data was obtained concerning the nature and extent of food advertising to children were included regardless of any shortcomings relating to other analyses within the study concerned.

Thirdly, each of the remaining 65 articles was examined to see whether these were unique studies or secondary articles emanating from a single study (either by the same or different authors). This final assessment produced separate totals for the number of articles and the number of studies included in this review:

- Ten of the studies included in this review, by the procedures above, produced secondary articles. These were studies by Atkin (Atkin 1975 and Atkin & Heald 1977), by Barcus (1971a and 1971b), by Byrd-Bredbenner & Grasso (1999a, 1999b, 2000a, 2000b and 2000c) by Dibb & Gordon (CWS Ltd 2000 and Dibb & Gordon 2001), by Dickinson (1997 and 2000), by Gussow (1972 and 1973), by Hammond et al, (1997b and 1999), by Taras & Gage (Taras & Gage 1995, Taras et al 2000), by Young (1987 and 1990) and another study by Barcus (Barcus 1975a, Barcus 1975b and Barcus with Wolkin 1977).

In combining the above assessments a total of 27 articles were excluded, leaving a total of 65 articles, reporting on 50 studies, to be included in this review.

Systematic Review 2: Review of the Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour

The searches retrieved 122 articles which were judged on the basis of their abstracts to be potentially relevant to Systematic Review 2. These were read by one reviewer to ascertain firstly that they were primary research studies, as opposed to opinion pieces or reviews. Reviews were excluded at this stage unless they stated explicit inclusion and exclusion criteria for the literature reviewed. This excluded 27 articles (Alder 1979, Alder et al 1977, Baxter & Schroder 1997, Campbell & Crawford 2001, Consumers International 1996, Crockett & Simms 1995, Dawson & Jeffrey 1983, French et al 2001, Goldstein 1992, Gorn & Goldberg 1987, Hill 2002, Horgen et al

2001, Jeffrey et al 1980, Kennedy 2000, Meringoff 1980, Owen et al 1997a, Owen et al 1997b, Ray & Klesges 1993, Robinson 2001, Scammon & Christopher 1981, Sheikh et al 1974, Story et al 2002, Strasburger 1995, Williams et al 1993, Young & Hetherington 1996, Young et al 1996, Young 1990). The remaining articles were then read in full and assessed by two reviewers. A three-stage assessment was conducted. For the first stage of assessment, the reviewers rated each study on a more specific set of relevance criteria:

- It had to measure children's exposure or response to food promotion (as opposed to exposure or response to promotion in general). Several studies took a proxy measure of children's exposure to food promotion, hours spent watching television. It was initially decided that television watching could only be considered a valid measure of potential exposure to food promotion if it related to times of the day when there is a large amount of child-oriented programming, such as Saturday mornings or weekday afternoons. However, as this would have excluded some potentially useful and well-designed studies from an already limited pool of evidence, it was subsequently decided to re-include these studies, while acknowledging the difficulties associated with using television viewing as a proxy measure of food promotion exposure. The issues are discussed in the relevant sections.
- The response or effects measures had to include food-related knowledge, preferences and/or behaviour (as opposed to non-food related measures such as cognitive processing of advertising information, or ability to differentiate an advert from programming). On this basis, 15 of the studies were excluded (Butter et al 1981, Caution 1984, Dickinson 2000, Dickinson & Leader 1996, Diehl & Daum 1985, Hendon et al 1978, Jacoby & Kyner 1973, Jerome & Frese 1979, Joshi et al 2002, Kortzinger et al 1994, Macklin 1990, Paget et al 1984, NOP Solutions 1999, Pollard et al 2002, Stutts et al 1981). One further study (Jeffrey et al 1980) was excluded as it was a methodological article testing the efficacy of a behavioural eating test as a measure of children's eating behaviour.
- Only studies which examined actual food promotion originating from a commercial/industry source were judged relevant to the review. On this basis, six studies were excluded (Engell et al 1998, Feshbach et al 1979, Neale & Langase 1998, Schucker et al 1983, Wagner et al 1992, Wardle & Huon 2000). For example, Feshbach et al (1998) used 'mock' displays of food promotion, and Neale & Langase (1998) measured responses to hypothetical aspects of food promotion (for example, asking respondents whether their food purchase intentions would be affected if food labelling contained more or less information about fat content).

There were 11 discrepancies between the reviewers according to these relevance criteria, all of which were resolved by re-analysis of the studies. In total, 22 articles were excluded from the review according to these more specific relevance criteria.

Secondly, the methodology of each study was assessed according to basic methodological criteria:

- Information about sample design (number and age of subjects) had to be included. All types of sample design were permitted, including purposive, quota and convenience samples, providing these were clearly described.

- Information about data collection methods had to be provided. Data collection methods of all kinds, including experiments, surveys, observation and qualitative methods, were permitted providing they were clearly described.
- Information about data analysis procedures, including analysis procedures for qualitative and observational data, had to be provided.

There were no discrepancies between the reviewers according to these criteria. A further 18 articles (Baxter 1991, Clancy-Hepburn et al 1974, Fisher 1975, Foulds 2001, Fox 1981, Gelperowic & Beharrel 1994, Grossbart & Crosby 1984, Groves 2002, Hammond et al 1997c, Hill & Tilley 2002, Misra 1990, Morton 1995, National Food Alliance 1994, Neumark-Sztainer et al 1999, Raab 1985, Rust 1993, Stratton 1994a, Stratton 1994b) were excluded because they did not meet these basic methodological criteria.

In combining the above assessments a total of 67 articles were excluded, leaving a total of 55 articles reporting on 51 studies, to be included in this review.

Thirdly, the methodology/design of each study was again assessed to establish which studies were capable of answering each of the four review questions. Because the four questions (see Research Questions, pp48-49) were concerned with different types of effects and different orders of evidence, the methodological inclusion criteria varied for each question. This methodological assessment was carried out by three independent reviewers. There were nine discrepancies between the reviewers according to these relevance criteria, all of which were resolved by re-analysis of the studies.

Summary tables that list all excluded articles are provided in Appendix 8: Justifications for Exclusions.

(9) Data Extraction

Systematic Review 1: The Extent and Nature of Food Promotion to Children

Data extraction sheets were completed for all of the 50 studies included in Systematic Review 1 by one reviewer and assessed by a second reviewer. The data extraction sheet standardised the extraction of information across studies and provided a full but concise description of each study in terms of promotional channel, design, sample, measures, analysis and results. Completed data extraction sheets for all of the included studies are contained in Appendix 9: Data Extraction Forms for Systematic Review 1.

Systematic Review 2: The Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour

Data extraction sheets were completed for the 51 studies included in Systematic Review 2. Again, these were completed by one reviewer and assessed by a second reviewer. The data extraction

sheets provided a full but concise description of each study in terms of design, sample, methods and procedures, analysis and results. Completed data extraction sheets for all of the included studies are contained in Appendix 10: Data Extraction Forms for Systematic Review 2.

(10) Rating of Study Quality

Systematic Review 1: The Extent and Nature of Food Promotion to Children

For Systematic Review 1, a quantitative rating scale was developed to assess the quality of each of the 50 studies included in the review. Studies were scored, using a 1-5 scale where 1=poor and 5=very good, on five criteria. For studies measuring the extent of food promotions to children, the criteria were the sample's size (usually number of television adverts), diversity (number of promotional channels, including different television formats) and timing (including both longitudinality and market segmentation by hour of the day, day of the week and season of the year) as well as the thoroughness of the analysis, and the clarity and completeness of data reporting. For studies measuring the nature of food promotions to children, the criteria were the sampling procedure used (as defined by the criteria measuring extent), the rating or coding procedures used (eg. the use of standardised or validated instruments and the diversity of ratings) and the use of rating reliability (eg. the number of raters, their expertise or independence and the use of reliability statistics), as well as an assessment of the analysis and reporting. The minimum a study could score was five and the maximum 25. Studies were scored and banded into three categories: 5-11 = lower scoring studies 12-18 = medium scoring studies, 19-25 higher scoring studies. These judgments of quality were then used in assessing how much weight to attach to the findings of each study.

Where a study addressed both 'extent' and 'nature' of food promotion to children, a separate rating was obtained in relation to each. So, for example, a study which examined both the extent and the nature of food promotions to children may have scored 14 in relation to extent and 19 in relation to nature, and therefore would be rated a medium scoring study in relation to its evidence on the extent of food promotions and a higher scoring study in relation to its evidence on the nature of food promotions.

Systematic Review 2: The Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour

A similar quality rating procedure was followed for each of the 33 studies included in Q2 – Q4 of the second Systematic Review; that is, for the 33 experimental, cross-sectional and observational studies judged capable of demonstrating a potential causal relationship between food promotion and children's food knowledge, preferences and behaviour. The remaining 18 studies, whose results are examined in Q1 of the second Systematic Review, were not capable of demonstrating a causal relationship, and were mostly simple surveys reporting only descriptive data. It was not judged necessary to carry out a quality rating assessment of these studies.

The 33 more complex studies were scored using a scale from 1-5 where 1 = poor and 5 = very good, on five criteria: the quality of the exposure measure, the quality of the effect(s) measure(s), the

appropriateness of the analysis procedures, the extent and thoroughness of the analysis, and the clarity and completeness of data reporting. Again, the minimum a study could score was five and the maximum 25. Studies were scored using an individual rating card for each study, and were banded into three categories: 5-11 = lower scoring studies, 12-18 = medium scoring studies, 19-25 = higher scoring studies. Two reviewers conducted the ratings independently; disagreements were resolved through discussion. These judgements of quality were then used in assessing how much weight to attach to the findings of each study.

Where a study was capable of answering more than one review question (for example, if it measured the effects of food promotion on both knowledge and consumption behaviour), a separate rating was obtained in relation to all relevant questions, as different effects measures and analyses may have been used. So, for example, a study which examined both knowledge and consumption behaviour may have scored 17 in relation to knowledge and 19 in relation to consumption behaviour, and therefore would be rated a medium scoring study in relation to knowledge, and a higher scoring study in relation to evidence of its effects on consumption behaviour.

Review Results: Systematic Review 1: The Extent and Nature of Food Promotion to Children

Introduction

This review is subdivided into three sections: the first looks at the channels used to promote food to children; the second at the foods promoted to children; the third at the creative strategies employed to promote these foods. In each case trends over time are also discussed. Two further sections discuss the gaps and weaknesses in the literature and summarise the key findings. A brief description of the studies included for analysis in this review, in terms of their country of origin, print-format, study design, sample and measurements is outlined below.

Overview of the Evidence Base

A total of 65 English language articles from 50 separate studies were identified which adequately addressed issues relating to the extent and nature of the promotion of food to children. Only seven of these studies were undertaken wholly in the United Kingdom (Chestnutt & Ashraf 2002, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickinson 1997/2000, Lewis & Hill 1998, Young 1987/1990). A further four studies were multi-national, but included data from the UK (Consumers International 1996, Longman 2000 & 2002, Young et al 1996). The studies from other countries included in this review comprise: three Australian studies (Hill & Radimer 1997, Morton 1984 & 1990); three New Zealand studies (Hammond et al 1997a & 1997b/1999, Wilson et al 1999); one Dutch study (Buijzen & Valkenburg 2002); and four multi-national studies excluding the UK (Consumers International 1999, Hawkes 2002, Horgen et al 2001, Ji & McNeal 2001). The remaining 28 studies were conducted wholly in the USA (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Choate 1972, Condry et al 1987/1988, Consumers Union 1995, Cotugna 1988, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Kuribayashi et al 2001, Macklin & Kolbe 1984, Messner et al 1999, Muehling & Kolbe 1998, Ogletree et al 1990, Rajecki et al 1994, Reece et al 1999, Solomon et al 1982, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000, Winick et al 1973).

Twenty nine studies included in this review were, at least in part, published as academic journal articles. The academic journals can be broken down into subject areas: twenty four per cent ($n = 7$) were from nutrition/dietetics journals; the same (24%) were published in health journals; twenty one per cent ($n = 6$) appeared in marketing/advertising journals; and 17 per cent ($n = 5$) in communications journals. The remainder ($n = 4$) were published in journals on other subjects. Some of the included studies were published in more than one journal, but for the purpose of the previous figures, each study has been counted once. Most of the articles are from peer reviewed journals. In the case of some of the older studies, it is not known if the journals were peer reviewed at the time,

although currently they are.

Of the remaining twenty one studies reviewed in this chapter: two were published as a complete book (Barcus with Wolkin 1977, Winick et al 1973); three as book chapters (Barcus in Palmer & Dorr 1981, Horgen et al in Singer & Singer 2001, Reece et al in Macklin & Carlson 1999); two as published conference presentations (Klebba et al 1994, Solomon et al 1982) and 14 as reports (Barcus 1971a/1971b, Consumers International 1996 & 1999, Consumers Union 1995, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Hammond et al 1997a, Hawkes 2002, Longman 2000 & 2002, Messner et al 1999, Young 1987/1990, Young et al 1996).

Forty two of the studies involved the collection of original data, the remaining eight were review articles (Barcus 1981, Byrd-Bredbenner 2002, Dibb 1993, Hawkes 2002, Horgen et al 2001, Longman 2000 & 2002, Young et al 1996). As well as producing or reviewing cross-sectional studies, 14 of the studies measured time-trends in food promotion. However, only four of these were (at least partly) longitudinal studies in their experimental design (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/Barcus & Wolkin 1977, Condry et al 1987/1988, 1987/1988, Morton 1990). The remainder only made comparisons with data from other studies (many of which are also included in this review) (Alexander et al 1998, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 2000a, Cotugna 1988, Dibb 1993, Gamble & Cotugna 1999, Klebba et al 1994, Lewis & Hill 1998, Reece et al 1999, Taras & Gage 1995/Taras et al 2000).

Although most of the studies included original data collection, this principally took the form of cross-sectional snapshots of food promotions to children in a particular place and at a set point in time. While this created difficulty in establishing an evidence base to fully address the review questions relating to time-trends the problem was offset by the fact that, when combined, the studies produce data from three decades. Seven studies originated in the 1970s, eight in the 1980s, 24 in the 1990s and 11 were published post-2000.

Q1: (1) What promotional channels are being used to target children?

Studies Under Review and Findings

(i) Promotional channels investigated

All of the studies relevant to this review investigated food marketers' use of at least one promotional channel to target children. Television advertisements dominate the published literature on food promotions to children. Prior to 2000, there was only one published article that focussed on any other promotional channel. Only three studies included in this review did not examine television advertisements (Consumers Union 1995, Hawkes 2002, Longman 2002), and only another two focussed on other forms of promotion as well as television advertising (Horgen et al 2001, Longman 2000). Television is itself a heterogeneous promotional channel and this was reflected in the variety of approaches to researching this medium. These included examining the differences between types of television output (eg. networks versus independents, broadcast versus cable or national versus local). Some examined market segmentation by time of television output, for example weekend versus weekday or child versus adult programming, or compared television advertisements with the

portrayal of food during non-commercial television output, for example public service announcements or in-programme information.

(ii) Television Formats and Output

Studies examining television, particularly those conducted in more recent times, tended to sub-divide television output between different service providers. Specifically, five studies examined both national broadcast networks and local, independent terrestrial television channels (Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Solomon et al 1982, Taras & Gage 1995/Taras et al 2000). Another eight studies examined national broadcast networks, cable networks and satellite channels (Consumers International 1996 & 1999, Klebba et al 1994, Lewis & Hill 1998, Reece et al 1999, Kunkel & Gantz 1992, Ji & McNeal 2001, Rajewski et al 1994). Comparisons between these types of television network showed that food commercials were more prevalent in advertisements on major national networks, while toy advertisements were relatively more common on other forms of television (Barcus 1981, Consumers International 1999, Kunkel & Gantz 1992, Solomon et al 1982). Suggestions as to why this should be so ranged between simple economies of scale to direct links between some channels and the toy manufacturers (eg. using cartoon characters). The exception to this was a study that found breakfast cereal advertisement were broadcast less on national network television (Lewis & Hill 1998).

As well as overt food commercials, some of the studies looked at other sources of nutritional information conveyed via television. These included 11 studies examining food advertisement and (food-related) public service announcements (PSAs) (Barcus 1981, Barcus 1975a/1975b/Barcus & Wolkin 1977, Byrd-Bredbenner & Grasso 1999a/1999b/2000b/2000c, Condry et al 1987/1988, Gamble & Cotugna 1999, Hill & Radimer 1997, Kotz & Story 1994, Morton 1990, Reece et al 1999, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000). A further six studies looked at product/programme tie-ins (Barcus 1975a/1975b/Barcus & Wolkin 1977, Chestnutt & Ashraf 2002, Consumers International 1996, Hawkes 2002, Messner et al 1999, Morton 1990). Two studies also described aspects of the actual food content of television shows transmitted between the monitored commercial breaks (Dickinson 1997/2000, Gussow 1972/1973).

(iii) Identification of Children's Programming

In practice, regardless of country or origin, there were only two time-slots identified as set aside for predominantly children's viewing (with television ratings (TVR) greater for children than for adults). These were weekend morning television (known as "SMTV"), examined in isolation by 12 studies (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a, Byrd-Bredbenner 2002, Choate 1972, Cotugna 1988, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Kotz & Story 1994, Macklin & Kolbe 1984, Ogletree et al 1990) and the mid-week after-school slot (known as children's hour or the "C" hour). The latter was examined in isolation by one study (Barcus 1975b). Combinations of, or comparisons between, weekend morning television and weekday children's television commercial activity were looked at in 11 studies (Barcus 1981, Barcus & Wolkin 1977, Condry et al 1987/1988, Ji & McNeal 2001, Kunkel & Gantz 1992, Klebba 1994, Lewis & Hill 1998, Solomon 1982, Taras & Gage 1995/Taras et al 2000, Wilson et al 1999, Young 1987/1990).

Studies of prime time or post-watershed television were included in this review if they focused upon or made specific reference to children's exposure to commercial activity during these time slots. One

study looked only at prime time or family television, where children and adults would be exposed to commercials together (Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c). This time slot was usually after the children's hour or evening meal times and tended to have a much higher number of children watching (TVR greater than 30 in the UK, see Young 1987/1990) than during children's programmes (SMTV or "C" hour). Prime time was used as a comparison slot to children's television in 10 studies, including SMTV (CWS Ltd 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Kuribayashi et al 2001, Muehling & Kolbe 1998), the "C" hour (Hammond et al 1997a, Morton 1984 & 1990) and both (Buijzen & Valkenburg 2002, Chestnutt & Ashraf 2002, Dickinson 1997/2000). Three of these studies, all from the UK, also examined 'post-watershed' television (aimed solely at adults, and transmitted much later in the day), comparing this slot with prime time, SMTV and "C" hour broadcasting (CWS Ltd 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Dickinson 1997/2000).

Rather than selecting specific time slots, nine studies obtained their samples of children's advertisements by other means. For example, Alexander et al, (1998) looked at archived children's shows, while Consumers International (1996) looked at "dedicated children's programming". Hammond et al (1997b/1999) metered what children watched, Hill & Radimer (1997) selected children's programmes from a regulatory code and Messner (1999) looked at sports shows. Rajecki et al (1994) selected out advertisements for children's meals, Reece et al (1999) selected shows from child audience figures. Stern & Harmon (1984) defined children's shows via conversations with directors while Winick et al (1973) obtained children's advertisements from agencies.

(iv) Other Promotional Channels

Although only five of the studies included in this review were not solely focused upon television advertising, other promotional channels were mentioned and promotional links between television and other media were identified. There was little mention of other forms of above-the-line promotion (ie. direct advertising) such as the printed media (eg. comics or magazines) (Consumers International 1999, Hawkes 2002), on public signage (Hawkes 2002), through direct mailing (Consumers International 1999) or over the internet (Consumers International 1999, Hawkes 2002, Longman 2002).

More attention was paid to the links between television and other media through below-the-line promotional techniques (ie. other than overt advertising). These techniques included: sponsorship, including sports (Chestnutt & Ashraf 2002, Consumers International 1996 & 1999, Consumers Union 1995, Dibb 1993, Hawkes 2002, Messner et al 1999, Morton 1990); in-school marketing (Consumers International 1999, Consumers Union 1995, Dibb 1993, Hawkes 2002, Horgen et al 2001, Longman 2002); point-of-sale (Hawkes 2002); free samples of food items (eg. distribution via comics) (Consumers International 1999, Dibb 1993); free gifts/tokens (premiums) with food items, including toys or collectibles bearing the product's name (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1980, Byrd-Bredbenner 2002, Consumers International 1999, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Doolittle & Pepper 1975, Hawkes 2002, Hill & Radimer 1997, Kotz & Story 1994); loyalty clubs (Hawkes 2002); inter-active food (Longman 2000); novel packaging (Dibb 1993, Longman

2000); tie-ins with movies (Hawkes 2002); tie-ins with computer software (Consumers Union 1995, Dibb 1993); and other forms of wider brand building (Alexander et al 1998, Byrd-Bredbenner & Grasso 1999a, Consumers International 1996, Consumers Union 1995, Dibb 1993, Hawkes 2002, Ji & McNeal 2001, Longman 2002, Messner 1999, Young 1987/1990).

Of the three studies not focussing on television advertising, one (Consumers Union 1995) examined in-school marketing, the second (Longman 2002) focused on internet promotions and the third (Hawkes 2002) focused on the variety of promotional techniques used in global brand building by two soft-drinks (*Coke* and *Pepsi*) and two fast-food companies (*McDonalds* and *Yum! (KFC & Pizza Hut)*). All four of these companies produce products identified as brands promoted to children in the other studies included in this review. Of the two studies that focused only partly on television advertising, one (Horgen et al 2001) also examined in-school marketing while the other (Longman 2000) also examined product innovation.

Discussion

Methods

Fifty studies investigated the use of at least one promotional channel by food marketers to target children. Of these studies, three were higher scoring (ie. better quality) (Kunkel & Gantz 1992, Rajecki et al 1994, Young et al 1996). A further 29 were of medium scoring quality (Alexander et al 1998, Barcus 1975a/1975b/Barcus & Wolkin 1977, Buijzen & Valkenburg 2002, Chestnutt & Ashraff 2002, Condry et al 1987/1988, Consumers International 1996, Consumers International 1999, CSW 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickenson 1997/2000, Hammond et al 1997a, Hill & Radimer 1997, Horgen et al 2001, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Kuribayashi et al 2001, Lewis & Hill 1998, Longman 2000, Longman 2002, Messner et al 1999, Morton 1990, Muehling & Kolbe 1998, Reece et al 1999, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000, Winick et al 1973, Young et al 1987/1990) and 18 were of lower scoring quality (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1981, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers Union 1995, Choate 1972, Cotugna 1988, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Hawkes 2002, Hammond et al 1997a, Macklin & Kolbe 1984, Morton 1984, Ogletree et al 1990, Solomon 1982, Wilson et al 1999).

Forty seven studies examined television advertising to at least to some extent (Alexander et al 1998, Atkin 1975/Atkin & Heald 1997, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Chestnutt & Ashraff 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1996, Consumers International 1999, Cotugna 1988, CSW 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickenson 1997/2000, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Hammond et al 1997a, Hammond et al 1997a, Hill & Radimer 1997, Horgen et al 2001, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Kuribayashi et al 2001, Lewis & Hill 1998, Longman 2000, Macklin & Kolbe 1984, Messner et al 1999, Morton 1984 and 1990, Muehling & Kolbe 1998,

Ogletree et al 1990, Rajecki et al 1994, Reece et al 1999, Solomon 1982, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000, Wilson et al 1999, Winick et al 1973, Young et al 1987/1990, Young et al 1996).

These television studies were restricted to investigating output during certain time-slots, which authors regard as children's television (SMTV and the "C" hour). In reality, children may often view or be exposed to advertising during programming that is not directly produced for them.

Findings

Although a great variety of potential avenues for promoting food products to children were identified, most research in this area has concentrated on television advertisements. There may be some justification for this, as television has been identified as the most important medium for promoting food to children.

Q1: (2) What is the relative spend in each of these promotional channels?

Studies Under Review

Only two of the studies relevant to this review considered spend when quantifying food promotion to children (Dibb 1993, Horgen et al 2001). To compensate for the paucity of studies new data was obtained by the CSM from data specialists AC Nielsen. This new data provided figures for advertising spend in the UK for all food brands (in total and for each individual brand), broken down by promotional channel, for the years 1994, 1998 and 2002.

Although few studies looked at spend, a number of other research strategies were employed by 25 of the studies included in this review in order to gauge the extent of food promotion to children (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Chestnutt & Ashraf 2002, Choate 1973, Condry et al 1987/1988, Consumers International 1999, CWS Ltd 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Doolittle & Pepper 1975, Gussow 1972/1973, Ji & McNeal 2001, Klebba et al 1994, Kunkel & Gantz 1992, Kuribayashi et al 2001, Lewis & Hill 1998, Macklin & Kolbe 1984, Morton 1984 & 1990, Solomon et al 1982, Winick et al 1973, Young 1987/1990). These research strategies included: a comparison of the amount of television advertising for food during children's programming with that during adults' programming; comparing the extent of food promotions with other products promoted to children; and comparing the extent of such promotions over time. To a certain extent, measures such as the relative amount of air-time or the relative number of advertisements for children's food promotions could be considered as proxy measures of the likely relative spend on children's food promotion.

Findings

(i) Studies of Extent by Spend

Neither of the two studies that investigated spend provided a breakdown of this by promotional channel. It should also be noted that spend data may include not only direct promotion to the consumer, but also intra-industry promotions. This was not considered in any of the studies.

The new data on spend obtained by the CSM confirmed that television was indeed the prime medium used for advertising food to children. The data revealed that television had consistently made up at least 75 per cent of all advertising spend in the UK in recent years. Although these figures relate to advertisements for all food brands and not just children's products, those which were most advertised were those identified in the studies as children's brands. This is in line with the findings of Dibb (1993) who stated that foods were the most advertised products on television and that, excluding tea and coffee, the food items with the highest spend were products heavily advertised to children.

(ii) Comparisons with Adults

The relative extent of food promotion to children was compared with the extent of food promotion to adults in six studies (Chestnutt & Ashraf 2001, CWS Ltd 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Kuribayashi et al 2001, Morton 1984 & 1990). Studies comparing post-watershed advertising with that aimed at children found that children were exposed to more food advertisements than adults. In a study by Dibb & Castell (1995), it was reported that the proportion of advertisements for food products was seven in 10 during the children's hour (the "C" hour) and five in 10 during Saturday morning television (SMTV), but only two in 10 post-watershed. The same study reported that advertisement for foods high in fat, sugar or salt reached 100 per cent during children's viewing, but between 86 per cent and 96 per cent during adult viewing. The same pattern was found in the study by CWS Ltd (2000) which reported that only 21 per cent of post-9pm advertisements were for food products compared to 48 per cent of SMTV and 58 per cent of "C" hour advertisements. Furthermore, 95 to 99 per cent of the advertisements during children's viewing times were for products high in either fat (30 to 40%), sugar (63 to 74%) or salt (27 to 49%). The corresponding figures after the 9pm watershed were 88 per cent of advertisements high in at least one of fat (25%), sugar (25%) or salt (49%).

A similar pattern was uncovered in another UK study by Chestnutt & Ashraf (2001), which compared late prime time (7 to 10pm) with children's television advertisements (both SMTV and the "C" hour). In that study 62.5 per cent of children's advertisements were for food (of which 73.4% of which were sugared and deemed detrimental to oral health), compared with only 18.4 per cent in the late prime time slot (only 18.6% of which were deemed detrimental to oral health). This was in line with an American study by Kuribayashi et al (2001) which found that significantly more food advertisements were broadcast on SMTV than during Saturday prime time television. Furthermore, these advertisements were more likely to be unhealthy overall, classified as high in cholesterol or sugar. Similarly, a medium scoring study by Morton (1990) found that although there were fewer advertisements in the "C" hour compared to prime time (87 minutes compared with 161 minutes), proportionally more of these were for food (76% and 37% respectively). The breakfast cereal advertisements in the "C" hour were more likely to be for pre-sugared varieties, with relatively more advertisements for non-sugared breakfast cereals broadcast during prime time viewing.

(iii) Comparisons with Other Promotions Aimed at Children

The issue of the relative amount of food promotion in comparison to other products aimed at children was dealt with in 17 studies (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1999, Doolittle & Pepper 1975, Ji & McNeal 2001, Klebba et al 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Macklin & Kolbe 1984, Solomon 1982, Young 1987/1990). All these studies looked at relative amounts of toy and food promotion. The amount of promotional activity involving toys was of greatest relevance to the six studies which covered seasonal variations in advertising to children (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977, Condry et al 1987/1988, Consumers International 1999, Solomon 1982, Young 1987/1990). Advertising in the children's market in the run up to Christmas was dominated by toy manufacturers at the expense of all other advertisers, including food. One US study (Solomon et al 1982) found levels of food advertising during November as low as 35 per cent (for networks) and six per cent (for local television). The inclusion of studies reporting data on the promotion of toys was useful to this review, helping to quantify the extent of food promotions in children's advertising and providing comparative findings on the techniques employed to promote products aimed at children other than food.

Comparisons across the various studies included in this review are difficult because they use different methodologies and definitions. For example, a medium scoring study by Winick et al (1973) purposely excluded toy advertisements because of their seasonally distorting effect. That study reported that, excluding toys, "non-edibles" constituted only 6.4 per cent of commercials produced for children and only 0.7 per cent of those broadcast. Meanwhile another study, also conducted in the USA around the same time by Gussow (1972/1973), reported that 82 per cent of television advertisements monitored were for "ingestible items", including gum and vitamins.

Discussion

Methods

Two studies considered the amount of spend when quantifying the extent of food promotion to children (Dibb 1993, Horgen et al 2001). Both studies were of medium scoring quality. Twenty five studies used other strategies to gauge the extent of food promotion to children. Of these studies, one was of higher scoring quality (Kunkel & Gantz 1992), 14 were of medium scoring quality (Alexander et al 1998, Barcus 1975a/1975b/Barcus & Wolkin 1977, Buijzen & Valkenburg 2002, Chestnutt & Ashraff 2002, Condry 1987/1988, Consumers International 1999, CWS 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Ji & McNeal 2001, Klebba et al 1994, Kuribayashi et al 2001, Lewis & Hill 1998, Morton 1990, Winick et al 1973) and 10 were of lower scoring quality (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1981, Choate 1973, Doolittle & Pepper 1975, Gussow 1972/1973, Macklin & Kolbe 1984, Morton 1984, Solomon et al 1982, Young 1987/1990). There was a dearth of studies using spend data to consider the extent and nature of food promotion to children. Studies tended to equate amount of advertising with spend,

but relied on inference rather than evidence. There was an over-reliance on data taken from content analysis of advertisements and an absence of studies measuring actual exposure. Crucially, there was also an absence of consumer studies: measures of the messages and information that children are actually exposed to. The latter is particularly important, given the fact that it is now widely accepted that the audience is an active participant in the communication process (see Narrative Review 1).

Findings

Three findings emerge from this section of the review. First, television is the dominant promotional channel used by marketers to promote food to children. Second, food makes up a far greater proportion of promotions aimed at children than it does with adults. Third, food products dominate children's advertising, with only toys being promoted on a comparable scale. Toys were the only other products advertised to children to an extent sufficient to allow meaningful comparison.

Q1: (3) What are the time-trend changes?

Studies Under Review

Only one study (Horgen et al 2001) considered time-trends in food promotion by spend. However the new data collected by the CSM was particularly useful in addressing this issue. Also another six studies used other means to investigate either past or potential future time-trends. (Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers International 1999, Hawkes 2002, Longman 2000 & 2002, Morton 1990). These included examining changes in the use marketers have made of promotional channels over time and reviews identifying the development of new media that may be used to promote food to children.

Findings

(i) Studies of Trends by Spend

Only the study by Horgen et al (2001) mentions time-trends in food promotion by spend, and this was restricted to illustrating the rise of fast-food promotions. However, the new data obtained by the CSM revealed that television is indeed the main conduit of food advertising in the UK by spend. This is shown in Figure 8 (below), which indicates that television has been by far the dominant promotional channel throughout the past decade. Yet, unlike other channels, spend on television advertising appeared to be decreasing in, both relative and absolute terms, by 2002. It should be noted that these amounts, presented in Figure 8, refer to all advertised food brands and not those specifically targeted at children, but the food brands most often promoted to children receive the greatest advertising spend.

Figure 8: Promotional Channels used by Advertised Food Brand by Spend

Promotional Channel	Spend (£'s)	% of Total
1994		
Press	27,725,675	7.7%
Cinema	4,599,387	1.3%
Radio	2,737,497	0.8%
Outdoor	12,863,159	3.6%
Television	311,678,519	86.7%
TOTAL (all promotional channels 1994)	359,604,237	
1998		
Press	42,475,694	9.5%
Cinema	6,996,346	1.6%
Radio	8,738,025	1.9%
Outdoor	25,374,517	5.6%
Television	365,523,498	81.4%
TOTAL (all promotional channels 1998)	449,108,080	
2002		
Press	42,678,099	9.4%
Cinema	11,543,145	2.6%
Radio	16,242,834	3.6%
Outdoor	39,582,806	8.8%
Television	339,456,036	75.1%
Direct mail	2,453,171	0.5%
TOTAL (all promotional channels 2002)*	451,956,091	

* Includes £2,453,171 from direct mail, not included in 1994 and 1998 totals.

(ii) Trends in Extent of Promotional Channels

It is possible to attempt to gauge the relative change in the amount of food promotion to children over time by looking at studies which compared the length of commercial breaks (number of, and lengths of advertisement for, food) during children's television programmes. This revealed mixed results across studies, depending on countries and decades. Over time the situation becomes increasingly complicated and difficult to assess owing to changes in advertisement length, numbers of advertisement breaks, numbers of advertisements, state/national differences, changing regulations and the increasing numbers of channels and types of television formats (major broadcast networks, cable, satellite or local). For example, the national broadcast channels tended to carry more food advertisements compared to the newer forms of television, so the inclusion of the more toy-orientated cable channels in later studies may have artificially lowered rates of exposure to food advertisement. A study by Byrd-Bredbenner & Grasso (2000a) did attempt to gauge changes in advertisement rates across USA studies, concluding that advertisement time had remained constant, with the proportion of food advertising increasing. In a study with a true longitudinal design, Morton

(1990) found that advertisement time in South Australia was decreasing, but this was offset by a sharp increase in the number of food advertisements. In conclusion it would appear that, even allowing for changes in advertisement length, frequency and any restrictions imposed on advertising, the extent of television commercials in general, of which half or more tend to be for food products, is increasing. Given the proliferation of channels and formats over time (eg. local, satellite, cable) the potential extent of children's exposure to food promotions seems likely to increase, even if the proportion of food advertising falls.

Television advertising studies have also implied that there is an ongoing trend towards branded and away from generic food products. This is in part because of an overall trend away from staples and ingredients towards ready meals and fast-food restaurants. The rise of branded food items implies that there is increasing opportunity for food manufacturers to spread promotions across numerous channels, including below-the-line activities (Hawkes 2002). One study looked at potential future trends in food promotion to children (Longman 2000). These included below-the-line marketing activities such as branding, packaging and the advent of new 'fun' food. Another apparent time-trend was the rise of new media (Consumers International 1999, Longman 2002). These new promotional channels, such as the internet, text message and emails, were felt to be particularly effective at reaching young people, perhaps without parental consent (though also through parental involvement).

Overall, it can be concluded that: for most of the year food products dominate children's television advertising; children are exposed to more of this promotional activity than adults; and this pattern is likely to be repeated, albeit on a smaller scale, across a wide range of other promotional channels.

Discussion

Methods

Only one study (Horgen et al 2001) considered time-trends in food promotion by spend. This study was of medium scoring quality. A further six studies used other means to investigate time-trends. Four were of medium scoring quality (Consumers International 1999, Longman 2000 & 2002, Morton 1990) and two were of lower scoring quality (Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Hawkes 2002).

This review question was identified as a particularly under-researched issue. This was true both in terms of analysis by spend and by an absence of studies providing comparable quantitative data on time-trends.

Findings

Although the evidence-base addressing this review question is weak, it was apparent that the number of channels through which food is marketed to children has grown and is likely to increase in future. To date this increase in promotional channels appears to have been restricted to an increase in the volume and diversity of television output (eg. satellite, cable).

The need to examine promotional channels other than television commercials is likely to become more pressing in the near future. There are two reasons for this. First of all, television may no longer be such a dominant medium. The rise of new media, such as the internet or text-messages needs to be assessed. Secondly, there was some evidence found in this review for the continued rise of branded food products. In future, these may be advertised solely on brand name and/or image appeals. Such brand building would create the opportunity for increased below-the-line marketing (ie. away from overt television commercials). Given this trend, it would seem necessary for future research to look beyond overt above-the-line advertising (especially television advertising) and focus more on the below-the-line promotional activities of children's food brands.

Q2: (1) What food items are being promoted to children?

Studies Under Review

Forty one of the 50 studies reviewed conducted a content analysis of television advertisement which provided a measure of the extent of food promotion to children (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Chestnutt & Ashraf 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1996 & 1999, Cotugna 1988, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickinson 1997/2000, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Hammond et al 1997b/1999, Hill & Radimer 1997, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Kuribayashi et al 2001, Lewis & Hill 1998, Macklin & Kolbe 1984, Messner et al 1999, Morton 1984 & 1990, Muehling & Kolbe 1998, Ogletree et al 1990, Reece et al 1999, Solomon et al 1982, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000, Wilson et al 1999, Winick et al 1973, Young 1987/1990). Thirty seven of these studies also provided a breakdown of the different food items (or their dietary contents) promoted to children (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Chestnutt & Ashraf 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1996 & 1999, Cotugna 1988, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickinson 1997/2000, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Hammond et al 1997b/1999, Hill & Radimer 1997, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Kuribayashi et al 2001, Lewis & Hill 1998, Messner et al 1999, Morton 1984 & 1990, Muehling & Kolbe 1998, Reece et al 1999, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000, Wilson et al 1999, Winick et al 1973, Young 1987/1990).

The main method used in these studies was viewing videotapes (or live monitoring, prior to the invention of video) of television channels which carry commercials. One study differed in that it first obtained 236 children's advertisements directly from 66 agencies, then attempted to observe their level of exposure on television during commercial breaks (Winick et al 1973). Only one content analysis study measured what children were actually exposed to, using a 'people meter' method to monitor family viewing (Hammond et al 1997b/1999).

The data obtained from these content analyses were then subdivided (eg. by product, health status or nutritional content) by a judge/rater or teams of raters and judges. These tended to be the author or the author(s) plus appointed others (ranging from under-graduate students to ‘experts’) who would decide what the content of each advertisement was. Eighteen studies differentiating between the extent of promotion of food items used reliability statistics to test for internal measures of rater reliability (Atkin 1975/Atkin & Heald 1977, Buijzen & Valkenburg 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Condry et al 1987/1988, Doolittle & Pepper 1975, Hill & Radimer 1997, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Kuribayashi et al 2001, Lewis & Hill 1998, Macklin & Kolbe 1984, Muehling & Kolbe 1998, Reece et al 1999, Solomon et al 1982, Winick et al 1973).

Aside from testing for rater reliability, these content analysis studies tended to report their data mainly in descriptive terms (eg. as percentages of all advertisements or of all food advertisements or of all cereal advertisements). There was very little secondary analysis of the food data (eg. how the nutritional and promotional variables related to each other). Inferential statistics were used by only seven studies in this review to describe the patterning of the extent of food promotions (Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Chestnutt & Ashraf 2002, Condry et al 1987/1988, Cotugna 1988, Kunkel & Gantz 1992, Kuribayashi et al 2001, Reece et al 1999).

Findings

(i) Product Breakdown

The categories used to describe food promotions varied greatly between the studies reviewed, making comparisons between each difficult. For example, the level to which food advertisements were categorised into products, items, brands or nutrients varied greatly. At the most basic level were the 16 studies which looked at the relative amounts of advertising for specific food items, such as breakfast cereals or candy (confectionery) (Atkin 1975/Atkin & Heald 1977, Buijzen & Valkenburg 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1999, Doolittle & Pepper 1975, Gussow 1972/1973, Hammond et al 1997b/1999, Klebba et al 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Messner et al 1999, Muehling & Kolbe 1998, Reece et al 1999, Stern & Harmon 1984, Winick et al 1973). These studies were for the most part either early examples of this kind of research or primarily focused upon toy advertisements or children’s advertisements in general, rather than on food promotions.

Twenty one studies examined television advertised food items in more detail, attempting to estimate their actual nutritional content (ANC) by a variety number of techniques (Barcus 1971a/1971b & 1981, Barcus with Wolkin 1977, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Byrd-Bredbenner 2002, Chestnutt & Ashraf 2001, Consumers International 1996, Cotugna 1988, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickinson 1997/2000, Gamble & Cotugna 1999, Hill & Radimer 1997, Kotz & Story 1994, Kuribayashi et al 2001, Morton 1984 & 1990, Taras & Gage 1995/Taras et al 2000, Wilson et al 1999, Young 1987/1990). The sophistication of these examinations of ANC varied from simple subjective observational categorisations of food items into either relatively healthy or unhealthy options (eg. by

subdividing breakfast cereals between pre-sugared and non-sugared), through making comparisons with dietary recommendations, to studies which aimed to use more objective quantitative measures of nutritional content of the foodstuffs themselves. Techniques for achieving the latter varied between setting cut-offs for the amount of fats, sodium (salt) or sugar per serving (Consumers International 1996, Kuribayashi et al 2001, Young 1987/1990) through to using specialised dietary software to calculate the effect the advertised diet would have upon a child (Wilson et al 1999).

(ii) The Advertised Diet

Eight studies made comparisons between the advertised diet and an acknowledged recommended diet (Byrd-Bredbenner & Grasso 1999a/1999b, CWS Ltd 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Dickinson 1997/2000, Gamble & Cotugna 1999, Hill & Radimer 1997, Kotz & Story 1994, Wilson et al 1999). These guidelines varied according to each study's country of origin, and included the United States' Department of Agriculture (USDA) food pyramid and the UK's national food guide pie chart plate. No matter what the recommendations were, a clear pattern emerged that the advertised diet was too high in fats, sugars and salt and also that it was lacking in meats, fruit and vegetables (especially fresh, non-processed meat, fruit and vegetables). Fibre recommendations were usually met because of the high number of (mainly sugared) breakfast cereal promotions.

One study focused on children's oral health in television advertisements (ie. dentistry rather than dietary recommendations) (Chestnutt & Ashraf 2001). This study also concluded that the advertised diet was unhealthy.

The reason behind this unhealthy advertised diet lay in the almost universal finding that televised children's food promotions were dominated by the 'big four' food items (Alexander et al 1998). The four comprised breakfast cereals, confectionery, savoury-snacks; and soft drinks. Almost every relevant study included in this review identified these four as all or some (often depending methodology of categorisation) of the most frequently advertised food items to children (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Chestnutt & Ashraf 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1996, Consumers International 1999, Cotugna 1988, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickinson 1997/2000, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Hammond et al 1997b/1999, Hill & Radimer 1997, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Messner et al 1999, Morton 1990, Muehling & Kolbe 1998, Reece et al 1999, Stern & Harmon 1984, Wilson et al 1999, Winick et al 1973).

To the big four food items might be added a fifth type of food advertisement: fast-food outlets (as opposed to specific food items) appeared to have significantly increased their share of children's advertising in recent years (Reece et al 1999). Advertisements for fast-food restaurants, which were included separately in content analyses of 17 studies, could not readily be classified as single food items, or coded for nutritional content (Atkin 1975/Atkin & Heald 1977, Barcus 1981, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers

International 1996, Dibb 1993, Gamble & Cotugna 1999, Hammond et al 1997b/1999, Hill & Radimer 1997, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Morton 1984, Muehling & Kolbe 1998, Reece et al 1999, Wilson 1999, Young 1987/1990). Promotions of these products were made on the basis of whole meal experiences rather than as specific food items. A fast-food restaurant advertisement may mention several meals and each of these could include a variety of complicated food items, such as burgers, containing meat, vegetables, bread and dairy produce with French fries (chips) and a choice of soft drink (Consumers International 1996, Gamble & Cotugna 1999, Hill & Radimer 1997).

This raises the issue of additional foods in children's advertising: foods in an advertisement other than the food item that is actually being promoted. When these additional items were examined, a different pattern was uncovered. Byrd-Bredbenner & Grasso (2000c) stated that when the additional items in fast-foods are taken into account, the majority of bread and the meat groups, as defined by the USDA Food Pyramid, seen in prime time television advertisements, is made up from burgers or sandwiches. Potatoes, in the form of fries or chips are the most seen vegetables. Similarly, a study by Hill & Radimer (1997) found the top two additional food items present in Australian children's television advertisement to be fruit (9.6%, mainly contained in cereals) and vegetables (5.8%, contained in sandwiches or as toppings on pizza). Additional foods tend to be highly processed rather than fresh (eg. chips rather than potatoes) and as such these need not always make the advertised diet healthier. For example, a lower scoring study by Morton conducted in South Australia (1984) had two advertisements for fresh fruit (apples), but these were then shown being baked into "high energy" foods.

The study by Morton (1984) was the one instance where the usual pattern of the advertised diet comprising the big four, plus or minus fast-food, was not found, yet the overall picture remained unhealthy. That study found fewer food advertisements than elsewhere and, although 44 of 120 food advertisements were for confectionery, only eight were for breakfast cereals, only two were for soft drinks and there were 10 each for snacks and fast-food outlets. Yet despite the lower representation of the big four, there still few advertisements for healthy products or staples, with other unhealthy products being more common (while 18 advertisement were for pies/pasties/sausage rolls only two were for apples). This suggests that, even if the extent of advertising for the big four could be limited, it would not necessarily spark a trend towards the increased promotion of healthy foods. Indeed, when a study looked at the potential effects of such regulations, this did appear to be the case. Taras and Gage (1995) observed that after the introduction of regulations limiting advertising time to children there was a fall in advertisements for breakfast cereals and a marginal fall in those for sweet snacks but against this there was a rise in advertisements for prepared food and dairy products. This left the overall advertised diet little changed in terms of the amount of sugar, fats and salt promoted.

Even when 'healthy' foods were being promoted, these tended to be promoted towards children only in their most unhealthy form. Examples included pre-sugared breakfast cereals, sweetened dairy products, processed meat (burgers), breaded fish, canned fruit and deep-fried vegetables (Chestnutt & Ashraf 2002, Consumers International 1996, Gamble & Cotugna 1999, Gussow 1972/1973, Taras & Gage 1995/Taras et al 2000).

(iii) Countering Sources of Dietary Information

A potential source of balance to this allegedly unhealthy dietary message promoted by television was identified by a medium scoring UK study (Dickinson 1997/2000). This study examined nutritional information contained in television programmes that children might equally be exposed to - the 'programme diet'. This study found that in contrast to the advertised diet, the programme diet did not appear to be promoting unhealthy eating. Although in this study fruit and vegetables (as defined by the UK national food guide) were the least advertised food category (1.6%), they were the most portrayed food category in the programmes that surrounded these advertisements (32.8%). Furthermore, the study found as many references to food were broadcast within television shows (52.4%) as during commercial breaks. While confirming all the concerns about the imbalance portrayed by advertisers, the author concluded that young people receive a more complex set of dietary information from television than the studies looking only at advertisements acknowledge. (It should be noted that this UK study is unique in that it included data from the non-commercial carrying BBC television channels.)

Televised public service announcements (PSAs) were seen as another potential source of more balanced dietary information. The 11 studies that examined PSAs universally found that these, at best, only made up tiny fraction of non-programme time during children's viewing. Furthermore, little nutrition-related information (NRI) was found within PSAs aimed at children, particularly in recent years when anti-drug messages tended to occupy the majority of such slots (Byrd-Bredbenner & Grasso 1999b/2000b/2000c, Condry et al 1987/1988). An Australian study by Hill and Radimer found no PSAs with NRI in a sample of children's television. Byrd-Bredbenner and Grasso (2000b) identified only one PSA with NRI in a sample of American prime time television, where a child was depicted giving an anti-drug message whilst eating French fries.

Discussion

Methods

Forty one studies provided a measure of the foods being promoted to children. One of these was of higher scoring quality (Kunkel & Gantz 1992), 27 were of medium scoring quality (Barcus 1975a/1975b/Barcus & Wolkin 1977, Buijzen & Valkenburg 2002, Chestnutt & Ashraf 2002, Choate 1972, Condry et al 1987/1988, Consumers International 1996 & 1999, Cotugna 1988, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995, Dickinson 1997/2000, Hammond et al 1997b/1999, Hill & Radimer 1997, Kuribayashi et al 2001, Lewis & Hill 1998, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Messner et al 1999, Morton 1990, Muehling & Kolbe 1998, Reece et al 1999, Stern & Harmon 1984, Taras & Gage 1995/Taras et al 2000, Winick et al 1973, Young 1987/1990) and 13 were of lower scoring quality (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1981, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Doolittle & Pepper 1975, Gamble & Cotugna 1999, Gussow 1972/1973, Macklin & Kolbe 1984, Morton 1984, Ogletree et al 1990, Solomon et al 1982, Wilson et al 1999).

The studies that addressed which food items were promoted to children tended to make use of

recorded television samples broadcast during time slots categorised as children's viewing. Although this method has some merit and is perhaps the obvious way to conduct such research, there are weaknesses in relying solely on such an approach. First, this does not address the extent of exposure to food promotions outside television, when television advertisements may be forging links with many other forms of promotion. Secondly, this takes no account of what children actually watch. Even when allowing for these underlying weaknesses, there are also problems in relation to the way that television exposes children to other nutritional information. These include children's viewing of advertisements aimed at adults, the programme-diet and additional food items, some of which may also appear in advertisements and that may be eaten along with those being advertised (eg. the milk consumed with breakfast cereals).

Findings

Examination of this review question has demonstrated that food and (to a lesser extent) toys dominate children's advertising. This may not be surprising, given that many of the products advertised to adults (eg. cars or health and beauty care items) are of little or no interest to children. Relatively few specific food items consistently take up the lion's share of children's advertising. Breakfast cereals, confectionery, snacks and soft drinks, along with fast-food restaurants and toys (which tend to takeover during the pre-Christmas period) are the products most promoted to children.

Without exception these food items were considered to be, or classified as, unhealthy by the studies included in this review. This is the case irrespective of whether 'unhealthy' is measured by food product or by some estimate of actual nutritional content. Specifically, a diet consisting of the equivalent proportions of food products promoted to children tends to be higher in fats, sugars and salt than is recommended. Furthermore, many potentially nutritious food products are promoted to children in their least healthy form (eg. processed or sweetened). This high proportion of unhealthy food products appears to come at the expense of generic foods, staples and healthy alternatives. In particular all the relevant studies recorded an almost total absence of promotion for fresh fruit or vegetables.

The advertised diet contrasts greatly with public health recommendations. In comparison to the extent of promotions for food products detailed above, only a very small number of promotions which provided information in support of the recommended diet were found. Studies of televised health promotion advertising or PSAs suggested that these were comparatively rare and that dietary information was conspicuous by its absence, with anti-drug messages taking most of these slots. However, the nutritional information contained in the surrounding television programmes (the 'programme diet'), did seem to be much closer to this recommended diet, according to the one study which closely examined this source of information.

In conclusion, the bulk of the evidence would appear to indicate that children are exposed to a great deal of promotion of unhealthy food items, with only limited exposure to sources that might promote healthy eating. All the studies reviewed highlighted apparent shortcomings in the extent of food promotion to children. Overall it can be concluded that the studies in this review have reported that the food products which are the most promoted to children are those which are likely to contribute

to an unhealthy diet, with an almost total absence of promotions for healthy food products.

Q2: (2) What are the time-trend changes?

Studies Under Review

A total of 13 of the studies in this review looked at time-trends in the extent of food promotion to children (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1975a/Barcus & Wolkin 1977, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Condry et al 1987/1988, Cotugna 1988, Dibb 1993, Gamble & Cotugna 1999, Lewis & Hill 1998, Morton 1990, Reece et al 1999, Taras & Gage 1995/Taras et al 2000). Only four of these used the author's own unique delimited and defined data, allowing true longitudinal comparisons of changes in the types of products being promoted to be made (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/Barcus & Wolkin 1977, Condry et al 1987/1988, Morton 1990). The other studies merely compared their data with other authors' published (or unpublished) work and were in effect little more than reviews of previous research. This reliance on others' work meant that the categorisations of food items differed to such an extent that it is difficult to draw as many conclusions as might otherwise be possible. However, by comparing articles published from the different content analysis studies included in this review (ie. from those published from the 1970s to the 2000s) it was possible to gather more evidence on the time-trends in the extent and nature of food promotion to children by using another 12 studies which were not themselves reporting on time-trends (Chestnutt & Ashraf 2002, Choate 1973, Consumers International 1996, CWS Ltd 2000/Dibb & Gordon 2001, Dibb & Castell 1995, Gussow 1972, Hawkes 2002, Horgen et al 2001, Ji & McNeal 2001, Kotz & Story 1994, Winick et al 1973, Young 1987/1990).

Findings

(i) Changes in the Pattern of Food Products Being Promoted

To be included in this review, articles must have been published from 1970 onwards. However one study used comparable data from the 1950s (Alexander et al 1998). Taking this as a baseline it would appear that since the 1950s food advertising to children has increasingly become dominated by the big four items. The study by Winick et al (1973) is of interest as it found that as recently as 1971 "foods for meals" made up 8.5 per cent of children's advertisements and seven per cent of advertisement broadcast time (excluding toys). Advertisements for such products were conspicuous by their almost total absence in more recent studies. Other studies conducted in the USA during the early 1970s also suggest that a non-negligible proportion (not exceeding 10%) of advertisement broadcast during children's viewing times were for meal food or staples (Choate 1972, Doolittle & Pepper 1975).

The rise in recent years of the advertisement of fast-food restaurants is particularly striking. Horgen et al (2001) quote spend data indicating that *McDonalds* moved from the fifth to the second biggest US advertiser between 1990 and 1992. The same authors state that this fast-food brand was believed to have become the most prolific advertiser in Europe by 1997. Similarly, in comparing television content analyses, Byrd-Bredbenner and Grasso (2000a) describe fast-food outlets as going from "virtually non-existent" to the largest advertisement category between 1971 and 1988. By contrast, Alexander et al (1998) found no such advertisements in their retrospective (though non-

systematically collected) sample of advertisement from the 1950s.

Comparability between studies was difficult: data on fast-food advertisements may exist, but being comparatively rare in the 1970s/1980s, may be buried in categories such as “restaurants” (Condry et al 1987/1988, Stern & Harmon 1984, Winick et al 1973), “drive-ins” (Choate 1972), “eating-places/meals” (Barcus 1975a/1975b/Barcus & Wolkin 1977) or “others”. In studies using US Department of Agriculture recommended diet food pyramid groups to compare data from 1972, 1976, 1987, 1994 and 1996, (Gussow 1972, Cotugna 1988, Gamble & Cotugna 1999, Kotz & Story 1994) a group category called “canned deserts, frozen dinners, drive-ins, peanut butter, oranges” rises from nine per cent, five per cent, 13 per cent, 17 per cent to 27 per cent over these respective dates.

By comparing the content analyses from the various studies included in this review it was possible to construct a model for development of this pattern of the big four items, plus fast-food restaurants. The dominance of the big four appeared to have first become established in the USA, at least by the early 1970s. In following decades, fast-food advertisements rose to rival these, although this archetype appears to have stagnated since the 1990s. Outside the USA, this pattern developed later. In Australia, for example, as detailed above, a 1984 study by Morton found fewer food advertisements in total and less advertisement in particular for the big four than was found in American studies. However, when the author repeated this study five years later, food advertisements dominated children’s advertising (76%, of “C” hour advertisement) with the most advertised products being breakfast cereals, confectionery, drinks and “food services & restaurants” (Morton 1990). This process may even be becoming global. For example, two recent studies which looked at food promotion in China (Hawkes 2002, Ji & McNeal 2001) noted that non-Chinese food items (eg. fast-food or ‘cookie’ brands) were encroaching on traditional food advertisement, with only minor concessions made to the local culture (‘glocal’).

The later establishment of the American pattern also occurred in the UK. For example, using SMTV and the “C” hour content analysis data collected in 1983 and 1984, Young (1987/1990) concluded that although food promotions constituted a large proportion of children’s advertising in the UK, it was on a much smaller scale than studies such as those by Barcus had found in the USA, especially in relation to sugared foods. Young (1987/1990) reported that around 33 per cent of UK children’s advertisement were for food, of which 34 per cent was pre-sugared, as opposed the American pattern where a majority of children’s advertising was for food with up to three-quarters of these being pre-sugared. However, more recent UK studies appeared to indicate that the UK has ‘caught up with the USA’, both in terms of the total extent of children’s food advertisement and their nutritional composition (Chestnutt & Asfrac 2002, Consumers International 1996, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Dibb & Castell 1995).

(ii) Trends in Food Brand Promotion by Spend

New data obtained by the CSM reveals that advertising spend in the UK on fast-food brands has been increasing in both relative and absolute terms over the past decade. Figure 9 (below) indicates that as recently as 1994 eight out of ten of the most advertised food brands (by spend) were breakfast cereals. However, by 2002 this proportion had fallen to two out of ten (in ninth and tenth

place). In contrast, by 2002, fast-food restaurant chains made up four out of the five most advertised brands and the other brand was a sugared soft drink commonly sold at fast-food outlets. Although these amounts do not refer to advertising spend specifically targeted at children, it is clear that the food products which predominate in Figure 9 are those identified by the studies as those which are most often promoted to children (ie. breakfast cereals, confectionery, soft-drinks, savoury-snacks and fast-food restaurants). As such these provide further evidence that trends in the UK have mirrored those found in the USA, with an increase in fast-food promotions replacing those for breakfast cereals as most promoted product (Byrd-Bredbenner 2002).

Discussion

Methods

Thirteen studies looked at time-trends in the extent of food promotion to children. Eight of these were of medium scoring quality (Alexander et al 1998, Barcus 1975a/Barcus & Wolkin 1977, Condry et al 1987/1988, Dibb 1993, Lewis & Hill 1998, Morton 1990, Reece et al 1999, Taras & Gage 1995/Taras et al 2000) and five were of lower scoring quality (Atkin 1975/Atkin & Heald 1977, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Cotugna 1988, Gamble & Cotugna 1999).

The lack of studies with a longitudinal design reduces the power of the evidence base in attempting to answer this review question. This situation is further complicated by the proliferation of promotional channels over time (especially television formats) and the differing product categories used in the articles considered in this review.

Findings

Despite the methodological shortcomings, a picture of time-trends in the extent to which different food items are promoted to children emerges. Promotions for staples and fresh healthy foods (eg. bread, fruit and vegetables) disappear to be replaced by the big four items (pre-sugared breakfast cereals, soft drinks, confectionery and savoury snacks) and fast-food outlets. This pattern developed first in the USA and has been exported elsewhere, including the UK, where it became established by the late 1990s. Although some of the food products promoted to children prior to this pattern may also have been considered unhealthy (eg. baking, such as sausage rolls and pies), this trend would appear to have involved a tendency towards an increasingly unhealthy advertised diet over time. As fast foods have replaced breakfast cereals as the most advertised food product or service, it may be concluded that that this dietary imbalance has intensified as time passes.

Figure 9: Trends in Advertising Spend Across the Top Ten Advertised Food Brands in the UK

BRAND	Spend (£'s)	% of Total
1994		
MCDONALDS – Fast-food restaurant	23,710,041	6.6%
KELLOGG'S, CORN FLAKES - Breakfast Cereal	8,826,923	2.5%
KELLOGG'S, CRUNCHY NUT CORN FLAKES - Breakfast Cereal	7,829,584	2.2%
BURGER KING – Fast-food restaurant	6,718,173	1.9%
KELLOGG'S, SPECIAL K – Breakfast Cereal	6,257,745	1.7%
WEETABIX - Breakfast Cereal	5,963,534	1.7%
KELLOGG'S, ALL BRAN – Breakfast Cereal	5,595,541	1.6%
KELLOGG'S, FROSTIES – Breakfast Cereal	5,415,821	1.5%
KELLOGG'S, FRUIT N FIBRE - Breakfast Cereal	5,369,699	1.5%
KELLOGG'S, BRAN FLAKES - Breakfast Cereal	5,135,179	1.4%
TOTAL (all food brands 1994)	359,604,237	
1998		
MCDONALDS – Fast-food restaurant	39,518,635	8.8%
BURGER KING – Fast-food restaurant	13,197,024	2.9%
KENTUCKY FRIED CHICKEN – Fast-food restaurant	9,011,184	2.0%
WEETABIX – Breakfast Cereal	8,618,330	1.9%
KELLOGG'S, CORN FLAKES - Breakfast Cereal	8,074,886	1.8%
PRINGLES, CRISPS – Savoury-snack	6,663,887	1.5%
KELLOGG'S, SPECIAL K, Breakfast Cereal	6,653,961	1.5%
WALKERS, CRISPS – Savoury-snack	6,485,245	1.4%
MARS, MARS BAR CHOCOLATE – Confectionery	6,470,848	1.4%
SHREDDED WHEAT – Breakfast Cereal	6,232,374	1.4%
TOTAL (all food brands 1998)	449,108,080	
2002		
MCDONALDS – Fast-food restaurant	41,973,066	9.3%
COCA COLA, ORIGINAL COKE – Soft-drink	15,531,274	3.4%
KENTUCKY FRIED CHICKEN – Fast-food restaurant	15,140,219	3.3%
BURGER KING – Fast-food restaurant	11,168,498	2.5%
PIZZA HUT – Fast-food restaurant	9,357,014	2.1%
COCA COLA, DIET COKE – Soft-drink	7,395,695	1.6%
PRINGLES, CRISPS – Savoury-snack	6,700,914	1.5%
KIT-KAT, CHOCOLATE BAR – Confectionery	6,469,021	1.4%
WEETABIX - Breakfast Cereal	6,366,666	1.4%
KELLOGG'S, CORN FLAKES - Breakfast Cereal	6,263,369	1.4%
TOTAL (all food brands)*	451,956,091	

* Includes £2,453,171 from direct mail, not included in 1994 and 1998 totals.

Q3: (1) What are the principal creative strategies used to target children?

Studies Under Review

Thirty four of the studies included in this review addressed the nature of food promotions to children (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers International 1996 & 1999, Consumers Union 1995, Dibb 1993, Doolittle & Pepper 1975, Gussow 1972/1973, Hammond et al 1997a, Hawkes 2002, Hill & Radimer 1997, Horgen et al 2001, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Longman 2000 & 2002, Messner et al 1999, Morton 1990, Muehling & Kolbe 1998, Ogletree et al 1990, RajECKi et al 1994, Reece et al 1999, Stern & Harmon 1984, Winick et al 1973, Young 1987/1990).

A broad range of creative strategies (attention-getting devices and selling points) was examined. These included: the format of advertisement (eg. characterisation, animation and tone); the theme of advertisement (eg. use of story line, humorous/serious tone); the theme appeals of advertisement (ie. the messages used to attract the customer); and the use of disclaimers by advertisement (ie. the information provided about the product).

As was the case with examining the extent of food promotions to children, the main method employed in examining the nature of food promotions to children was content analysis of television (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers International 1996 & 1999, Doolittle & Pepper 1975, Gussow 1972/1973, Hill & Radimer 1997, Hammond et al 1997a, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Messner et al 1999, Morton 1990, Muehling & Kolbe 1998, Ogletree et al 1990, RajECKi et al 1994, Reece et al 1999, Stern & Harmon 1984, Winick et al 1993, Young 1987/1990). However, six of the studies examined this issue using other methodologies, comprising five reviews which conducted case studies of promotions (Dibb 1993, Longman 2000 & 2002) or products (Hawkes 2002, Horgen et al 2001) and one was a exploratory convenience sample of promotional materials (Consumers Union 1995).

There was little agreement across studies over classification (coding) of the creative strategies to be analysed. This was coupled with the much greater potential for subjectivity by raters/judges (eg. what constitutes 'fun' as compared to what constitutes soft drinks). Fifteen studies used some kind of standardised rating scales or statistical validation of their coding systems and judges' ratings of creative strategies (Alexander et al 1998, Atkin 1975/Atkin & Heald 1977, Buijzen & Valkenburg 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Doolittle & Pepper 1975, Hill & Radimer 1997, Klebba et al 1994, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Muehling & Kolbe 1998, RajECKi et al 1994, Reece et al 1999, Stern & Harmon 1984, Winick et al 1973). Nevertheless, comparisons were difficult to make between studies that measured the nature of food promotion to children.

Most studies examining the nature of these food promotions also tended to report their data in descriptive terms only. Only nine studies used inferential statistics to describe relationships between creative strategies (Alexander 1998, Ji & McNeal 2001, Klebba 1994, Lewis & Hill 1998, Muehling & Kolbe 1998, Rajecki et al 1994, Reece et al 1999, Winick et al 1973, Young 1987/1990).

Findings

(i) Characteristics of Children's Food Advertisements

Sixteen studies looked at the characterisation in food advertisements aimed at children (Alexander 1998, Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Doolittle & Pepper 1975, Ji & McNeal 2001, Lewis & Hill 1998, Morton 1990, Ogletree 1990, Rajecki et al 1994, Reece et al 1999, Winick et al 1973, Young 1987/1990). This encompassed: examining whether the advertisement was live action or featured cartoon characters; who spoke for the food product (ie. actors or off-screen announcers); who appeared in the advertisement itself; and if they were portrayed using the product being promoted (ie. eating).

Like other television advertisements, the format of children's food advertising was characterised by off-screen male announcers and on screen male characters (Alexander 1998, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Doolittle & Pepper 1975, Ogletree 1990). Females were reported as being even less likely to appear in food advertisements than in those for other children's products (ie. toys) simply because many of these other advertisements were for gender-stereotyped products such as dolls (Ogletree 1990). The exception to this pattern was mothers, who could be portrayed as role models or providers in food advertisements (Atkin 1975/Atkin & Heald 1977). Other adults who appeared on-screen in food advertisements tended to be portrayed as either comic-book heroes or villains (Atkin 1975/Atkin & Heald 1977, Rajecki et al 1994). Advertisements for toys tended to only show children on-screen (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977). Children's advertisements other than for food products tended to show the product in use by children, such as playing with a toy (Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977).

Where children were seen consuming the product, diverse observations and conclusions were made by authors. Byrd-Bredbenner & Grasso (2000b) report a "mixed message" during prime time television where 89 per cent of actors observed consuming foods in food advertisements, are slim and healthy, despite 54 per cent of the food being consumed being rated as of "low nutrient density". Bredbenner (2002) states that the proportion of thin/average sized characters observed eating in food advertisements broadcast on SMTV had risen from 81 per cent in 1993 to 96 per cent by 1999. Ogletree (1990) discussed the absence of females in children's food advertisements in the context of eating disorders.

The use of animation techniques in television advertisements was examined in 10 studies (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977,

Barcus 1981, Doolittle & Pepper 1975, Lewis & Hill 1998, Morton 1990, Reece et al 1999, Winick et al 1973, Young 1987/1990). The use of animation was found to be particularly strongly associated with children's food advertisements compared with non-food (ie. toy advertisements) and also in comparison with adult orientated (food) advertisements (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Lewis & Hill 1998, Morton 1990). Breakfast cereal advertisements were identified as particularly likely to involve a mixed animation/live action format in which children encounter fantasy cartoon characters (Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Doolittle & Pepper 1975).

The use of animation or mixed animation/live action formats was seen as being an indicator of the humorous, light tone of children's food advertisements. A light tone could also be apparent from the demeanour of announcers, actors or the advertisement in general. Much less humour was observed in both adult-orientated advertisements and non-food advertisements aimed at children (Atkin 1975/Atkin & Heald 1977, Doolittle & Pepper 1975, Lewis & Hill 1998, Morton 1990), with toy advertisements in particular taking a very serious tone.

A higher scoring study by Rajecki et al (1994) looked at the tone of the story lines used in children's food advertisements in greater detail. The study focused only upon what the authors defined as meal foods (including breakfast). Despite intentionally looking only at what, in health terms, might be termed as the less negative food items promoted to children, where snacks, candy, cookies, soft-drinks and chews were excluded, the tone of the themes identified from the stories in such advertisements were not so positive. These included 'violence' (usually with animated characters), 'conflict' (social strife), 'trickery' (often with adults as the victims), 'achievement' (provided you eat the meal), 'enablement' (ie. cheating by using the product), 'mood alteration' (ie. drug like properties) and dependency (ie. addiction to the food product). Addiction as a selling point was also suggested in one other study (Consumers International 1999), as was mood alteration (Lewis & Hill 1998).

(ii) Theme Appeals

Theme appeals in children's advertisement was addressed by 15 of the studies (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Hammond et al 1997a, Hill & Radimer 1997, Ji & McNeal 2001, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Rajecki et al 1994, Reece et al 1999, Winick et al 1973, Young 1987/1990). Identified theme appeals included: the food product's taste (such as sweetness); nutritional/health properties; physical appearance/texture; fantasy/adventure themes; fun/humour; enablement/capability; price; novelty/modernity; and social aspects of the product. There was little consensus about the definition of these themes, making comparison difficult between studies.

The most popular appeals used in the promotion of foods to children were hedonistic: taste, humour, action-adventure and fun (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Buijzen & Valkenburg 2002, Hammond et al 1997a, Ji & McNeal 2001, Kotz & Story 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Reece et al 1999, Winick et al 1973, Young et al 1987/1990). A lower scoring qualitative study by Hammond et al (1997a)

pointed out that these hedonistic themes appeared greatest in television advertisements for food items they described as being of low nutritional value. Gussow (1972/1973) describes how by making such an association, advertisers can actually use counter-nutritional appeals. An example, detailed by Gussow, is an advertisement for a high-carbohydrate “fun” product that “youngsters prefer” which comes complete with “chocolaty super stuff” that is “seasoned and proportioned for the younger tummy”.

A related issue involved the promotion of vitamins or foods containing “necessary” or “added vitamins” to children. Prior to the introduction of regulations in the early 1970s, which prevented their promotion on television, advertisements for vitamins were relatively common in the USA (Barcus 1975a/1975b/Barcus & Wolkin 1977, Choate 1972, Gussow 1972/1973, Winick et al 1973). It was alleged that these were being pushed as a substitute for healthy eating, by articles citing slogans such as “sold to children in case you don’t eat right” (Choate 1972) and “to keep you growing right even if you don’t eat right” (Gussow 1972/1973). Similarly one study felt that the promotion of sugar-free gum might actually encourage the consumption of sugared food (Consumers International 1999). For example, an advertisement from Slovenia depicted a boy gaining in popularity by giving a girl some gum that would help to overcome the “wicked acids” produced by eating ice-cream.

Advertisements for breakfast cereals were uniquely identified as those most likely utilise nutritional or health claims as a theme appeal selling point (Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Consumers Union 1995, Hammond et al 1997a, Hill & Radimer 1997, Kotz & Story 1994, Reece et al 1999, Stern & Harmon 1984, Winick et al 1973).

(iii) Disclosures and Product Information

Related to theme appeals was the use of disclaimers/disclosures or other product information contained within children’s food promotions. The nature of disclaimers was examined in 11 studies (Alexander et al 1998, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Hill & Radimer 1997, Klebba et al 1994, Kunkel & Gantz 1992, Muehling & Kolbe 1998, Stern & Harmon 1984, Winick et al 1973, Young 1987/1990), three of which specifically focused upon disclaimers (ie. rather than on food promotions) (Klebba et al 1994, Muehling & Kolbe 1998, Stern & Harmon 1984). From these it was indicated that other products advertised to children (ie. toys) were much more likely to use disclaimers than food items and services (Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Klebba et al 1994, Muehling & Kolbe 1998, Stern & Harmon 1984). Again, the chief exception to this pattern was breakfast cereals (Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Hill & Radimer 1997, Klebba et al 1994, Kunkel & Gantz 1992) which in one study even exceeded toys in terms of the proportion of advertisement carrying disclaimers (Stern & Harmon 1984). Disclaimers for breakfast cereals were also the most likely of any type of children’s advertisement to use audio (or audio/visual) disclaimers rather than only visual disclaimers - important as only older children can read (Barcus 1975a/1975b/Barcus & Wolkin 1977, Klebba et al 1994, Kunkel & Gantz 1992).

The nature of disclaimers was found to vary depending upon the product promoted. Young (1987/1990) subdivided disclaimers between ‘intrinsic’ - referring to the product, and ‘extrinsic’ -

referring to the product's effects. Intrinsic disclaimers/disclosures were those said to be used to sell food (eg. the nutritional value of breakfast cereal or taste of confectionery). Fast-food restaurants were the exception, as these were thought to use extrinsic disclaimers to sell the brand. A higher scoring study by Muehling and Kolbe (1998) subdivided disclaimers between 'informative' - referring to what the product does do, and 'restrictive' - referring to what the product does not do. These authors found that toys, breakfast cereals and candy/gum tended to use informative disclaimers, while fast-food restaurants tended to use restrictive disclaimers.

The use of disclaimers could be controversial and hard to define. For example, as Barcus (1981) points out, the statement that a breakfast cereal was "*part* of a nutritious breakfast" could be considered a disclaimer, in that it was not stating that it *was* a nutritious breakfast. On the other hand, this could also be viewed as the misleading claim that it was implying that the cereal was a *necessary* part of a nutritious breakfast. Eight studies examined promotional activity making specific, perhaps unsubstantiated nutritional claims (Barcus 1981, Barcus 1975a/1975b/Barcus & Wolkin 1977, Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers International 1999, Dibb 1993, Gussow 1972/1973, Hill & Radimer 1997, Morton 1990). Examples of this practice include a product described as high in "energy" rather than "sugar" (Consumers International 1999, Morton 1990) and the use of vague, but loaded terms, such as "country fresh" or "natural fibre" (Barcus 1981, Hill & Radimer 1997, Morton 1990). The study by Hill and Radimer (1997) found that terms such as "natural" and "wholesome goodness" were applied to chocolate products in a majority of cases. Byrd-Bredbenner and Grasso (2000b) stated that "almost half" of food and drink advertisements made inaccurate or misleading claims.

(iv) Inappropriate Marketing

Making misleading claims was just one of many creative strategies identified in the reviewed studies as an inappropriate marketing strategy: there was no consensus about what constitutes inappropriate marketing and there was also potential for subjectivity in defining these practices across authors, raters or funding bodies. Studies did agree that, unlike the creative strategies used to sell food to adults, advertisements designed to promote food to children were said to utilise 'pester-power' or purchase-influence-attempts (PIA) (Atkin 1975/Atkin & Heald 1977, Barcus 1981, CWS Ltd 2000/Dibb & Gordon 2001, Gussow 1972/1973, Longman 2000, Winick et al 1973). Here the advertisements are designed to encourage the child to act as a salesperson for the product by attempting to persuade the parent to part with their money and buy it for the child, forming a bipartite relationship (Longman 2000). This practice could be extended to overt PIA messages such as "tell mom to buy one" (Atkin 1975/Atkin & Heald 1977), though on the whole the studies failed to find any evidence for the common usage of use of such overt pester-power (Atkin 1975/Atkin & Heald 1977, Barcus 1981).

A more subtle and commonplace creative strategy was the use of premiums or competition prizes offering collectibles (eg. toys). These could be used in up to 25 per cent of advertisements, particularly for breakfast cereals and fast-foods (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1975a/1975b/Barcus & Wolkin 1977, Barcus 1981, Byrd-Bredbenner 2002, Consumers International 1999, CWS Ltd 2000/Dibb & Gordon 2001, Dibb 1993, Doolittle & Pepper 1975, Hawkes 2002, Hill & Radimer 1997, Kotz & Story 1994, Winick et al 1973).

Similarly the use of celebrity (eg. endorsements by sports players or well-known cartoon characters) was thought to influence PIA (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977, Consumers International 1999, Dibb 1993, Reece et al 1999, Messner et al 1999, Winick et al 1973) However this was found to be a much less frequent practice than offering premiums, with only limited cases observed (Atkin 1975/Atkin & Heald 1977, Barcus 1975a/1975b/Barcus & Wolkin 1977, Consumers International 1999, Winick et al 1973). One study found that the use of celebrity was more strongly related to promoting eating experiences rather than food items (Winick et al 1973). The influence of celebrity role models was however felt to extend beyond overt advertising, such as characters in television shows. One author (Gussow 1972) identified these as another possible source of counter-nutritional information, citing the example of *Sesame Street*'s Cookie Monster. Another in-programme promotional issue was overt product placement. However, this was only noted occurring once during a Slovenian children's programme (Consumers International 1999).

The six studies that examined the phenomenon of programme/commercial tie-ins found the boundary between television shows and advertisement breaks to be less than clear cut. Products were promoted via programme sponsorship, usually by a short advertisement or jingle informing the viewer of this relationship at either end of the formal commercials. This could occur repeatedly, such as throughout a morning of SMTV. As with television advertisements, the food products that sponsored shows, and used tie-ins, tended to be those categorised as pre-sugared or of low nutritional value, with the same food items or services (eg. fast-food outlets) being present. For example, Chestnutt and Ashraf (2002) pointed out that the two Saturday and Sunday morning children's shows broadcast in the UK were sponsored by a confectionery and a sugared dairy product and that these made use of tie-ins. An Australian "C" hour sample, by Morton (1990), found that the 93 per cent of advertisements which were for food were augmented by tie-ins for *Kellogg's* (breakfast cereals) and *McDonalds* (fast-food). Messner et al (1999) noted sponsorship during sports programmes, both visual (eg. being seen on equipment) or audio (eg. "scores brought to you by"). In this way it can be seen that other forms of promotion, such as sponsorship, can reinforce or complement television advertising and that the boundaries between these promotional channels may be less than clear cut.

A non-television promotional channel which was felt to be particularly inappropriate by some authors was in-school marketing (Consumers International 1999, Consumers Union 1995, Horgen et al 2001, Longman 2002). This type of promotion was felt to be particularly effective at reaching children, even compared with television. In the study focussing on this issue (Consumers Union 1995), four types of in-school promotion were identified: sponsorship of materials; competitions; in-school media (eg. television); and direct advertising, including point-of-sale at vending machines. In this study 200 such materials were collected and the 111, including a teaching guide, analysed. Of the 21 concerned with nutrition, a food company sponsored all except one. Some, for example, *Kellogg's* 'Get Going with Breakfast', could be said to be overtly biased towards their products, in this case, cereals. Others such as *McDonald's* 'What's on your plate?' 'Balancing your act' and 'Healthy growing up' did not mention their products. Instead the brand name could only be seen on the credits (eg. of a video or poster). However, this was seen as an even more inappropriate strategy, allowing the *McDonald's* logo to be placed along side, and associated with, promotions for healthy activities. The report's authors conclude that in-school marketing provided opportunities for inappropriate promotion of unhealthy foods to children on a large scale.

Discussion

Methods

Thirty four studies addressed the issue of the nature of food promotion to children. Three studies were of higher scoring quality (Kunkel & Gantz 1992, Muehling & Kolbe 1998, Rajecki et al 1994), 19 were of medium scoring quality (Alexander et al 1998, Barcus 1975a/1975b/Barcus & Wolkin 1977, Buijzen & Valkenburg 2002, Consumers International 1996 & 1999, Hill & Radimer 1997, Horgen et al 2001, Ji & McNeal 2001, Klebba et al 1994, Kotz & Story 1994, Lewis & Hill 1998, Longman 2000 & 2002, Morton 1990, Ogletree et al 1990, Reece et al 1999, Stern & Harmon 1984, Winick et al 1973, Young 1987/1990) and 12 were of lower scoring quality (Atkin 1975/Atkin & Heald 1977, Barcus 1971a/1971b, Barcus 1981, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 1999a/1999b/2000a/2000b/2000c, Consumers Union 1995, Dibb 1993, Doolittle & Pepper 1975, Gussow 1972/1973, Hammond et al 1997a, Hawkes 2002, Messner et al 1999).

The studies reviewed tended to rely upon coding systems which not only differed from each other, but which could be seen as suffering from subjective ratings. Even when allowing for the use of reliability statistics, it must be questioned as to whether two or more (student) dieticians would define terms such as 'fun' or 'fantasy' or even 'health' in the same way as a food marketer, advertiser, parent or child. Similarly authors may be influenced by their funding bodies to define creative strategies as good or bad. For example, it was invariably felt that the use of animation was bad, irrespective of the quality of the animation (good or bad) or the message it was trying to convey. The use of case studies or sub-samples of selected advertisement to justify some author's claims must also be questioned.

Findings

The relevant studies under review found that the creative appeals in children's food advertising concentrated on 'fun' and 'taste', rather than on health or nutrition. This was true both in comparison with other food promotions (aimed at adults) and other promotions aimed at children (eg. toys, which tended to use more serious 'grown up' tones). The dominance of animation as a creative device was thought to illustrate this tendency. Full cartoon animations or mixed animation-live action methods were found to be more common in advertisement for children's food products than to those for either adult foods or non-food children's products. Other approaches commonly used to promote food to children included fantasy adventure, trickery and social strife, whereas serious or educational approaches, everyday home/work settings and pro-social messages tended not to be used.

A different pattern emerged for fast-food outlet advertising, which has become much more prominent in recent years. In this case, the product is often not even described and the focus is put on the 'magic moment' experience of the meal and the brand itself. The rise of fast-food promotion has been at the expense of promotions for breakfast cereals, which often include nutritional appeals and disclaimers and may be considered healthier in comparison to other food items promoted to children.

Q3: (2) To what extent are these different creative strategies being used?

Studies Under Review

Seventeen studies measured the relative extent that food marketers use these creative strategies to target children (Atkin 1975/Atkin & Heald 1977, Barcus & Wolkin 1977, Buijzen & Valkenburg 2002, Byrd-Bredbenner & Grasso 1999a, Consumers International 1996, CWS Ltd 2000/Dibb & Gordon 2001, Hammond et al 1997a, Hawkes 2002, Ji & McNeal 2001, Klebba et al 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Longman 2000, Morton 1990, Muehling & Kolbe 1998, Stern & Harmon 1984, Winick et al 1973).

Findings

Despite the diverse rating procedures of the studies in this review it was universally concluded that the food is promoted to children using themes such as taste rather than nutrition and fun or fantasy rather than health. An exception was found in the study comparing children's advertisements in the USA and China (Ji & McNeal 2001). Although about advertisement *per se*, rather than food promotion, food advertisements were so dominant in China that this was the only product category where meaningful comparisons could be made. Interestingly, Chinese food advertisements were more likely to use health (38.6%), quality (25.8%), texture (14.4%), social popularity (12.1%), or convenience (6.1%) as selling points and less likely to use fun (14.4%), uniqueness/novelty (18.2%) and fantasy/adventure (3.0%). The corresponding percentages for the US sample in that study were health (7.0%), quality (2.7%), texture (1.0%), social popularity (4.0%), convenience (2.0%), fun (43.5%), uniqueness/novelty (32.4%) and fantasy/adventure (14.7%). Although some global branded advertisements were observed in each culture, these differences were explained by the authors in terms of a combination of values (Confucianism versus consumerism) and economics (famine versus fun).

Although also more reliant on fun and fantasy/adventure, as explained earlier, breakfast cereal advertisements alone were found to regularly use nutritional appeals, regardless of whether or not these appeals were deemed to be misleading or disclaimers. The other exception to this pattern was advertisements for fast-food restaurants. These were found to focus on social appeals, the brand image and total experience of visiting the outlet, rather than food appeals such as taste, texture or health (Byrd-Bredbenner & Grasso 1999a, Consumers International 1996, Hawkes 2002, Kunkel & Gantz 1992, Winick et al 1973). However, in common with other forms of food promotions to children these fast-food advertisement also stressed hedonistic fun, for example 'Happy Meals' (Hawkes 2002).

Seven studies that also looked at the creative strategies used in the promotion of toys provided a comparison measure of the relative extent to which the different creative strategies were used to promote food to children (Atkin 1975/Atkin & Heald 1977, Barcus with Wolkin 1977, Klebba et al 1994, Kunkel & Gantz 1992, Lewis & Hill 1998, Muehling & Kolbe 1998, Stern & Harmon 1984). These advertisements were reported as: taking a more serious tone (usually spoken by an off-screen announcer); to use quite different theme appeals (eg. with appearance, amount, performance and power being relatively more common); display a much greater level of portrayal of

the product in use (usually by a male child, unless for dolls); make greater use of disclaimers; and consisted of straightforward live action formats.

Five studies compared the creative strategies used to promote children's food with those used to promote foods to adults (Barcus with Wolkin 1977, Buijzen & Valkenburg 2002, Lewis & Hill 1988, Longman 2000, Morton 1990). As with advertisement for other children's product (toys) these were found to take a more serious in tone, use different theme appeals (ie. with nutrition, price, convenience, quality and health being more common and with fantasy-adventure and fun less so). For example Morton (1990) noted that the breakfast cereal advertisement broadcast during the "C" hour tended to use animation and "bottom humour", while those broadcast later in the day tended to use nutritional appeals. However, one study (Lewis & Hill 1988) found that the creative strategies used in children's food advertisement were more similar to adult food advertisement than those for other children's products (ie. toys and entertainments) and other adult advertisements. The authors suggested this allowed for situations where children and parents may be watching television together, thus influencing the bipartite decision to purchase. Another recent study (Longman 2000) found some evidence that children's food promotions were becoming more in tune with both sets of theme appeals. This review cites case studies innovative food products such as *Kraft Lunchables*, utilising the themes of convenience, targeted at mum, and fun, targeted at the kids, *Quaker Dinosaur Eggs*, using health for mum and fun for kids and *Yoplait Frubes* which use all three theme appeals.

Discussion

Methods

Seventeen studies measured the relative extent to which creative strategies are used. Two of these were of higher scoring quality (Kunkel & Gantz 1992, Muehling & Kolbe 1998), 11 were of medium scoring quality (Barcus & Wolkin 1977, Buijzen & Valkenburg 2002, Consumers International 1996, CWS Ltd 2000/Dibb & Gordon 2001, Ji & McNeal 2001, Klebba et al 1994, Lewis & Hill 1998, Longman 2000, Morton 1990, Stern & Harmon 1984, Winick et al 1973), and four were of lower scoring quality (Atkin 1975/Atkin & Heald 1977, Byrd-Bredbenner & Grasso 1999a, Hammond et al 1997a, Hawkes 2002).

Those studies which attempted to investigate the extent to which each of these strategies were being used lay open to criticism because of the potential flaws associated with subjective ratings. It is much easier to count the number of advertisements for a product than it is to count the number of times an appeal such as fun is used. Attempting to quantify the extent of that fun relative to the fun in another type of advertisement is even more difficult. There is a danger that much of the coding and discussion reported by authors may be merely a reflection of their own views as they attempt to second guess what strategies or messages the marketers are intending to use and how the children are perceiving these.

Findings

Although the methodological weaknesses, detailed above, must be borne in mind, it does appear that the studies in this review have identified some key differences between children's food promotions and other types of promotion (eg. food promotions aimed at adults and toy advertisements). The main identifying feature of children's food advertisements appeared to be that

these were more likely to use hedonistic themes such as fun and fantasy, rather than real world appeals such as health or product value. Indeed, it may be the case that the most advertised and least healthy foods that use the most hedonistic and least health-orientated appeals. Not only was the advertised diet universally found to differ from the recommended diet and was viewed as unhealthy by comparison, but it also tended to rely upon counter-nutritional messages as a selling point to children.

Q3: (3) What are the time-trend changes?

Studies Under Review

Nine studies explored time-trends in the development of the creative strategies used to promote food to children (Alexander et al 1998, Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 2000c, Consumers Union 1995, Hawkes 2002, Horgen et al 2001, Klebba et al 1994, Longman 2000 & 2002).

Findings

The study by Alexander et al (1998) found a remarkable degree of consistency over time in the creative strategies used to promote food to children. This is noteworthy as the advertisements analysed from the 1950s pre-date the dominance of the big four items. For example the animated *Kellogg's* cereal characters *Tony the Tiger* and *Snap! Krackle! and Pop!*, were present from this sample and are still used today. In the following decades studies noted the decline of the off-screen spokesperson (Alexander et al 1998), an increase in the use of disclaimers/disclosures (Alexander et al 1998, Klebba et al 1994), a shift in the common use of premiums (eg. free toys) from breakfast cereals to fast-foods (Byrd-Bredbenner 2002), a greater use of animation (Alexander et al 1998) and the advent of other fun appeals such as interactive fun foods (Longman 2000). However, although open to subjective definition by raters/judges, inappropriate or misleading advertisements seemed to have declined over time (Byrd-Bredbenner & Grasso 2000c). This may be a response to an increase in advertising controls or alternatively an increased level of sophistication by the advertisers.

The rise of new media such as the internet, text messages and e-mail is thought to be creating new interactive (ie. fun-orientated) opportunities for the marketing of food to children (Longman 2000 & 2002). Examples of such new marketing opportunities include the use of viral marketing, on-line games/competitions, the sponsorship of computer games/educational packages and the opportunity to involve parents and schools in all these activities via the child's interest in the new media. In combination with increased development of fun foods or packaging, it is thought that these new promotional channels will continue to reduce the salience of the once dominant role of television in the marketing food to children (Consumers Union 1995, Hawkes 2002, Horgen et al 2001, Longman 2000 & 2002). This does not mean that television will cease to be the main channel used by those who promote food products to children, merely that more channels will be used and that the boundaries between these channels will become increasingly blurred, with brand stretching across each medium. An example of this is the link between television advertisement campaigns and

in-school marketing via teaching package sponsorship, internet tools/educational websites and branded equipment (Horgen et al 2001).

Discussion

Methods

Nine studies explored time-trends in the development of the creative strategies. Five were medium scoring studies (Alexander et al 1998, Horgen et al 2001, Klebba et al 1994, Longman 2000 & 2002) and four were of lower scoring quality (Byrd-Bredbenner 2002, Byrd-Bredbenner & Grasso 2000c, Consumers Union 1995, Hawkes 2002).

There were relatively few studies that investigated the change in the use of the different creative strategies being used to promote food to children. These studies tended to be explorative in nature and implied a need to research this issue in the future.

Findings

Although the same basic creative strategies (eg. television animation) have been used to promote food to children since such promotional activity first began, this long-term consistency appeared on the point of breaking down. There were two reasons for this. First, the rise of new media (eg. computers, text-messages, internet and email) has given rise to a host of new potential creative strategies, in themselves more likely to be both accessed and understood by young people than their parents (compared to television). Secondly, the evolution of brand stretching and globalisation has allowed promotional messages to cut across many different media and increased tie-ins with below-the-line marketing activities. These may now include links to new media (eg. branded, perhaps online, computer games), other new promotional channels (eg. in-school marketing) and more traditional avenues for below-the-line activities such as sports sponsorship.

Conclusions from Systematic Review 1

There are numerous gaps in the research base, and many weaknesses in the studies that have been undertaken. However, a consistent picture does emerge of children being exposed to a widely advertised diet higher in salt, sugar and fat than the recommended one. This is typically promoted using themes of fun and taste rather than health and nutrition and in frivolous rather than serious ways.

This does not, of course, mean that children are actually responsive to these messages or that they acquire unhealthy food knowledge, preferences and behaviour as a result of them. Answering these questions requires more complex research procedures and is the subject of the next systematic review.

Review Results: Systematic Review 2: The Effects of Food Promotion on Children's Food Knowledge, Preferences and Behaviour

Q1: How do children respond to food promotion?

Studies Under Review

Fifty one studies provided evidence of how children respond to food promotion. The methods and samples are described in detail in the data extraction sheets in Appendix 10.

The studies investigate a range of responses by children to food promotion:

- Recall of food adverts
- Liking for and attitudes towards food adverts
- Food purchase requests associated with food promotion
- Responses to food packaging
- Qualitative insights into children's engagement and interaction with food promotion
- The impact of food promotion on children's nutritional knowledge
- The impact of food promotion on children's food preferences
- The impact of food promotion on children's food purchase-related behaviour
- The impact of food promotion on children's food consumption behaviour
- The impact of food promotion on children's diet
- Other effects of food promotion.

Thirty three of these studies were also judged to be capable of answering Review Questions 2, 3 or 4 - that is, of examining potential causal links between food promotion and children's food-related knowledge, preferences and/or behaviour. These were primarily experimental studies (n=22) and cross-sectional studies (n=9) (there was also one observational study and one quasi-experiment) which utilized methods and analysis procedures capable of providing evidence of a potentially causal relationship between food promotion and effects on children. The rationale for including certain types of cross-sectional study is discussed under Question 2 below.

Eighteen studies were of designs which were not capable of providing evidence of a potentially causal relationship between food promotion and children's food-related knowledge, preferences and/or behaviour - simple surveys and qualitative studies. These studies were judged only capable of answering Question 1. To avoid repetition, only findings from studies which were only capable of answering Question 1 - ie. those which were not also capable of answering Questions 2, 3 and 4 - are reported in this sub-section.

The studies examined in this section were simple surveys, with three exceptions: an observational study (Atkin 1975a & 1978), and two qualitative studies (Maskill et al 1996, Dickinson 1997). Nine were North American (Atkin 1975a & 1978, Barry & Hansen 1973, Carruth et al 1991, Carruth et al 2000, Donohue 1975, Riecken & Yavas 1990, Taras et al 2000, Ward et al 1972,

Williams 1974), three were from the UK (Dickinson 1997, Donkin et al 1992 & 1993, Hitchings & Moynihan 1998), and five were from other countries: India (Radkar & Mundlay 2001, Unnikrishnan & Bajpal 1996), New Zealand (Maskill et al 1996), Puerto Rico (Del Toro & Greenberg 1989), and Saudi Arabia (Yavas & Abdul-Gader 1993). Eleven of the studies were conducted with children of nursery/primary school age, six with children of secondary school age.

Eight studies interviewed parents rather than (Donkin et al 1992 & 1993) or as well as children (Atkin 1975a & 1978, Carruth et al 2000, Dickinson 1997, Hitchings & Moynihan 1998, Radkar & Mundlay 2001, Maskill et al 1996, Taras et al 2000). It should be reiterated that studies were eligible for inclusion if they measured a response by children to food promotion, whether the response was reported by or observed in the child directly or was reported by the parents.

Findings

Findings from the studies are reported under seven themes: recall, liking and attitudes, communication, purchase-related behaviour, free gifts and packaging, desire for promoted foods, and qualitative studies.

(i) Recall of Food Promotion

Four studies examined children's recall of food adverts (Hitchings & Moynihan 1998, Yavas & Abdul-Gader 1993, Radkar & Mundlay 2001, Barry & Hansen 1973). Hitchings & Moynihan (1998) found that 9-10 year old English children were able to recall seeing adverts in the past two weeks in seven different food product categories, while Yavas & Abdul-Gader (1993) found that both Saudi Arabian girls and boys in grades 5-8 recalled seeing food adverts more frequently than adverts in other product categories. Radkar & Mundlay (2001) found that the adverts most frequently recalled by Indian children were for noodles, biscuits, soft drinks and chocolates, and that children showed higher levels of advertising recall than adults for all four products except noodles. Barry & Hansen (1973) compared North American 2nd grade white and black children's recall of food adverts, and found that both were able to recall advert content but that black children had poorer recall.

(ii) Liking for and Attitudes Towards Food Adverts

Seven studies investigated children's liking for food adverts and their advertising preferences (Yavas & Abdul-Gader 1993, Ward et al 1972, Donohue 1975, Del Toro & Greenberg 1989, Lam 1978, Riecken & Yavas 1990, Unnikrishnan & Bajpal 1996). Yavas & Abdul-Gader (1993) found that food adverts were the most popular types of television advert among Saudi grade 5-8 schoolchildren, followed by adverts for cars, soft drinks and detergents; Ward et al (1972) found that food adverts were the most popular adverts among middle class North American primary schoolchildren, followed by adverts for toys, programme trailers, soft drinks, cars and PSAs; and Donohue (1975) found that food adverts were the most popular adverts among North American black primary schoolchildren followed closely by programme trailers, toys and games adverts, and

adverts for medicines/vitamins. Lam (1978) found that food adverts were North American 4-7 year olds' second favourite type of adverts after toy adverts. Riecken & Yavas (1990) found that 8-12 year old North American children had more favourable attitudes towards adverts for toys than adverts for cereals, over the counter medicines or adverts in general. They also investigated the relationship between attitudes towards advertising in the three product categories and brand evaluations, to assess whether children's evaluations of brands were influenced by their pre-existing attitudes towards adverts. An association was found for only one of the three cereal brands and one of the toy brands, suggesting little clear relationship between attitudes to advertising and brand evaluations.

Two studies compared gender responses and found that girls responded more positively to food adverts than did boys: Del Toro & Greenberg (1989) found that 9th-12th grade Puerto Rican girls were significantly more positive about food adverts than their male counterparts, while Yavas & Abdul-Gader (1993) found that Saudi grade 5-8 girls liked food adverts significantly more than did boys. Barry & Hansen (1973) found that the colour of characters depicted in adverts was associated with significant differences in the advert preferences of 2nd grade North American black and white children.

Unnikrishnan & Bajpal (1996) examined Indian children's liking for cold drinks adverts. Adverts for Pepsi were the favourite among the sample as a whole and among 'upper' and 'middle' class children; 'lower' class children tended to prefer adverts for cheaper, Indian brands.

(iii) Communication about Food Promotion

Two studies indicated that children discussed food promotion with peers and families. Carruth et al (1991) found that among 887 US 10th-12th grade students, about 9% reported 'very often' or 'often' talking about food adverts with their parents, and about 6% 'very often' or 'often' discussing them with their friends. 72% reported 'never' or 'rarely' discussing adverts with their parents and 75% with their friends. Yavas & Abdul-Gader (1993) found that 89% of Saudi school students reported that they had ever discussed adverts with their parents (28% 'always', 61% 'sometimes').

(iv) Purchase-related Behaviour

Seven studies indicated that food adverts were perceived to trigger food purchase requests by children to parents (Del Toro & Greenberg 1989, Donkin et al 1992 & 1993, Hitchings & Moynihan 1998, Lam 1978, Radkar & Mundlay 2001, Taras et al 2000, Yavas & Abdul-Gader 1993). Del Toro & Greenberg (1989) found that between 35% and 48% of Puerto Rican male and female high school students reported asking their parents to buy foods they had seen advertised (between 35% and 48%), and reported buying advertised foods themselves. Younger respondents (9th-10th grade) were more likely to report asking their parents to buy foods they had seen advertised than older children ($p < 0.05$). Yavas & Abdul-Gader (1993) found that around a third of Saudi grade 5-8 school students said that they 'always' and 46% 'sometimes' asked parents to buy items they had seen advertised, and that parents agreed to the purchase 'always' (43.9%) and 'sometimes' (45.3%). In Lam's (1978) survey of North American 4-7 year old children and their

mothers, a quarter of children said that they ‘always’, and 59% that they ‘sometimes’, asked mothers to buy cereals they had seen advertised on television, and the majority of mothers said that they yielded to requests (55% ‘sometimes’, 9% ‘most of the time’). Taras et al’s (2000) survey of 237 low to middle income families with pre-school children found that a total of 176 different food items were reportedly requested by children “as a result of a television advertisement”. The study also asked parents to indicate which requested items they subsequently purchased. High-sugar cereals were by far the most requested item (280 requests, 157 purchases), followed by trips to restaurants (91 requests, 73 ‘purchases’), confectionery (58 requests, 34 purchases), fruit juice (55 requests, 36 purchases), low-sugar cereal (38 requests, 32 purchases), jello products (21 requests, 15 purchases), cookies (17 requests, 15 purchases) and chocolate (14 requests, nine purchases); all other items received fewer than 10 requests.

Donkin et al’s (1992 & 1993) survey of English parents of 7-11 year olds found that the largest category of children’s requests for foods seen advertised on television was for cereals (18%), followed by biscuits and cakes (11%), fruit and vegetables (11%), sweets and chocolates (10%), drinks (10%), and meat and meat products (9%). Eleven percent of requests were specifically for Kellogg’s cereals. Forty five percent of the requested products had added sugar. In Hitchings & Moynihan’s (1998) research with 9-10 year old children and parents in Newcastle upon Tyne, parents reported granting 96% of children’s food requests. Four of the ten foods which children most frequently asked their parents to buy also appeared in the top ten most frequently recalled food adverts by children. Radkar & Mundlay (2001) found that ‘child’s demand’ for the product was reported by Indian parents as a substantial influence on buying decisions for several categories of food product.

One study (Williams 1974) found that North American 9-13 year olds spent ‘almost half’ their weekly allowance on snacks and that 44% reported buying snacks they saw advertised on television.

(v) Response to Free Gifts and Packaging

Three studies (Carruth et al 2000, Atkin 1975a & 1978, Donohue 1975) found that free gifts and packaging attributes attracted children’s attention and appeared to stimulate demand for products. Carruth et al (2000) found that food packaging attributes influenced the choices of North American middle and upper income 5 year old children when they were asked to choose from pairs of food items differing in one or two attributes such as colour of packaging, characters depicted on the packaging, free gift, game depicted on the packaging, shape or the picture of the food. The most commonly given reasons for their choices by children were, in descending order: liking/favourite, flavour/taste, characters or action figures, product type, colour, the foods depicted on the package, prior consumption, appearance, free gift, because parents buy it, and health reasons.

Atkin (1975a & 1978) observed interaction between North American parents and 3-12 year old children while shopping for cereal in a supermarket. In two-thirds (66%) of situations, the child initiated the interaction by demanding (46%) or requesting (20%) a cereal. Just under a tenth (9%) of children explicitly identified the free gift as the main reason for wanting a cereal, and observers indicated that up to a quarter of children appeared to make their decision at least partly on the basis

of the free gift. Children mentioned nutritional considerations as the main reason in only 1% of interactions. Donohue (1975) found that when North American black primary schoolchildren were asked whether the cereal itself or the free gift was more important in selecting a cereal, both were equally important for boys, but for girls, the free gift was the main consideration (56% free gift, 44% cereal), and 1st grade children appeared to put more emphasis on the free gift than on the cereal, although none of the differences were significant.

(vi) Desire for Promoted Foods

Carruth et al (1991) found that eight percent of North American 10th-12th grade students reported that seeing a food advert made them want to get something to eat ‘every day’, 14% ‘several times a week’, 27% ‘once or twice a week’, 25% ‘less than once a week’, and 27% ‘never’. Responses to an open-ended question about what snacks were consumed in front of the television indicated that crisps (55%), fizzy drinks (21%), popcorn (21%), cookies (19%), sandwiches (18%), fruit (15%) and sweets (14%) were most frequently reported. Del Toro & Greenberg (1989) found that 9th-12th grade Puerto Rican girls reported significantly greater desire for foods seen in adverts than their male counterparts.

(vii) Qualitative Studies

Two studies were qualitative (Maskill et al 1996, Dickinson 1997). Maskill et al (1996) explored how 13-16 year old New Zealand children engaged with food advertising and their perceptions of how it influenced their buying and consumption behaviours. Although television advertising was not perceived to be a significant influence on the young people’s behaviour, several respondents reported how they felt that television advertising did influence their buying and consumption habits in selected product categories including sweets, takeaway foods and crisps. Amongst other reasons, they also reported liking food advertising because it made them aware of the product and made them feel hungry. In the Dickinson (1997) study, 11-18 year olds from the UK demonstrated that they could recall the voice-overs featured in food adverts almost word for word.

Discussion

Methods

Only three of the studies reviewed in this section were conducted in the UK (Dickinson 1997, Donkin et al 1992 & 1993, Hitchings & Moynihan 1998), and many were conducted over ten years ago. The studies were primarily simple surveys, with relatively small and/or non-randomly selected samples. A few made statistical comparisons – for example, between boys’ and girls’ liking for food adverts (Del Toro & Greenberg 1989), black and white children’s recall of adverts (Barry & Hansen 1973), or between younger and older adolescents’ food requests (Del Toro & Greenberg 1989) – but the majority simply reported descriptive data.

Findings

The studies found that children recalled food adverts, that food adverts tended to be among their favourites, and that children discussed food promotion with peers and families. Children perceived themselves to be influenced by television advertising to make food purchase requests to their parents. Similarly, parents perceived their children to be influenced by food promotion to request specific foods, and perceived that they themselves responded to these requests. Three studies indicated that free gifts and packaging attributes attracted children's attention and appeared to stimulate demand. The studies which made statistical comparisons between different groups indicated that there were some gender, age and racial differences in how children responded to food promotion. It is difficult to draw conclusions about any patterns in demographic differences in response from the small number of studies reported here, particularly given the heterogeneity in sample size and composition.

Overall, the studies indicated that food promotion is noticed and enjoyed by children, and is perceived by parents and by children themselves to influence their communication and shopping behaviour. This suggests that the creative strategies examined in Systematic Review One have persuasive power. The focus, in the research to date, on advertising and (to a lesser extent) packaging leaves unanswered questions about the impact of other promotional activity, such as sponsorship, new media and branding.

The studies reported above were not capable of establishing any causal link between food promotion and food knowledge, preferences and behaviour. For this, more complex research designs are needed, and these will be examined in the next three sections. However, the studies reported here do suggest that it is sensible to look further for such causal links.

Q2: Is there a causal link between food promotion and children's food knowledge, preferences and behaviour?

Introduction

Thirty three studies investigated whether there was a causal link between exposure to food promotion and children's food knowledge, preferences and behaviour. Food knowledge was defined as including general perceptions of what foods are 'good' and 'bad' to eat, perceptions and understanding of what constitutes a balanced diet, perceptions and knowledge of the nutritional value of different food products, ability to understand the composition of processed foods, and understanding of nutritional concepts. Food preferences were defined as including both liking for specific foods and preferences between different foods.

Food behaviour was defined broadly, as including purchasing and purchase-related behaviour, consumption behaviour, and diet and health status. Purchasing included both individual and household purchasing, while purchase-related behaviour referred to behaviour designed to influence parents to buy particular products. Consumption behaviour was defined including one-off consumption (such as the amount of food eaten on one occasion), short-term consumption (such as daily selection of foods for consumption over a short period of time), and self-reported regular

patterns of consumption behaviour (such as reported frequency of eating sweets). Studies which measured children's diet and nutrient intake, and health-related variables such as obesity and cholesterol, were also examined under behaviour.

The thirty three studies comprised 22 experimental studies, one observational study, one quasi-experiment, and nine cross-sectional studies. The rationale for including cross-sectional studies is discussed below. The vast majority of the studies were North American; only one, reported in Question 2.6, was from the UK.

Findings are reported in this section under six sub-questions:

- Q2: (1) Does food promotion influence children's nutritional knowledge?
- Q2: (2) Does food promotion influence children's food preferences?
- Q2: (3) Does food promotion influence children's food purchasing and purchase-related behaviour?
- Q2: (4) Does food promotion influence children's food consumption behaviour?
- Q2: (5) Does food promotion influence children's diet and health-related variables?
- Q2: (6) Other effects of food promotion

Cross-sectional Studies

Cross-sectional studies provide a different order of evidence to that provided by experiments. They are potentially able to take more naturalistic measures of behaviour than are experimental studies, which involve exposing subjects to highly artificial situations. However, simple correlations in cross-sectional studies limit the inferences that advertising has a causal influence on children's knowledge, preferences and behaviour. Partial correlations which control for confounding variables help to establish the relationship with more confidence, but the question of causal direction remains problematic. Does exposure to food promotion cause particular attitudes and behaviours, or do particular attitudes and behaviours lead to more attention to food promotion? It is plausible that pre-existing knowledge, attitudes and habits may lead children to selectively attend to food promotion messages which are consistent with those prior orientations. In other words, causality may flow in either direction.

The difficulties are compounded by the fact that 'frequency of television viewing' is used in most of the cross-sectional studies as a proxy measure of exposure to food advertising. This measure has both strengths and weaknesses. Clearly it does not represent as precise a measure of exposure to advertising as that provided by an experimental study in which a subject is compelled to attend to a specially designed advertising stimulus. Hours spent watching television does not necessarily equate with watching commercials: a child may 'channel hop' through a commercial break, leave the room or simply not pay attention while adverts are on. However, reported television watching is a more naturalistic measure of behaviour than is behaviour in a laboratory experiment, which may bear little relation to how people are exposed to advertising in real life. Furthermore, there is clearly a common sense link between television watching and exposure to advertising: a child who watches no or very little television will have little contact with television advertising, while a child who watches several hours a day has the opportunity to see thousands, if not tens of thousands, of advertising

messages each year.

The usefulness of 'frequency of television viewing' as a measure of food promotion exposure can be strengthened in a number of ways. Television viewing at times of the week characterized by frequent child-oriented advertising, such as Saturday mornings and weekday afternoons, is a stronger measure of potential exposure to food promotion than is general television viewing. Some studies measure viewing at specific child-oriented times of the week, and some also measure, for comparison purposes, viewing at more adult-oriented times of the week, such as primetime or Saturday evening. Another approach is to ask children which programmes they watch. This can serve as a general indicator of viewing at child-oriented times of the week, or can be combined with other data to obtain a more precise measure of potential exposure to food promotion: for example, Bolton (1983) asked children to keep a viewing diary over a given period, then calculated from broadcast data which commercials were shown during those programmes, thereby generating a reasonably precise measure of what food advertising would have been potentially seen by each respondent.

It was decided that cross-sectional studies were of potential value to the review because they are capable of measuring behaviour in more naturalistic contexts and of examining, through relevant statistical analysis, multiple relationships between exposure to food promotion and effects. However, cross-sectional studies were only judged capable of answering questions about the effects of food promotion on children if their design and analysis procedures permitted causal inferences to be drawn. This meant that a cross-sectional study had to have an assessment of the strength of the possible causal relationship through measuring the extent of the exposure and of the possible effect. It also had to meet at least one of the five criteria for causality proposed by Bradford-Hill (Hill 1965¹):

- a) Temporality: through measuring exposure before possible effect
- b) Reversibility: through measuring exposure before possible effect, then possible effect after exposure has been withdrawn
- c) Dose response: through measuring possible effects at different levels of exposure
- d) Consistency: through measuring different but similar possible effects or through measuring effects in different sub-groups (eg. in different ethnic groups)
- e) Specificity: through measuring different but similar exposures (eg. promotion of toys) or through measuring widely different possible effects

Figure 10 (on the following pages) lists all the studies included in the review and indicates which of these causal criteria each study was judged capable of meeting.

¹ Hill AB (1965). The environment and disease: association or causation? *Proceedings of the Royal Society of Medicine* 58: 295-300.

Figure 10: Analysis of Studies Examined for Q2

STUDIES				TESTS OF CAUSALITY						COMMENTS
	Exposure	Effect	Design	1. Strength	2. Temporality	3. Reversibility	4. Dose response	5. Consistency	6. Specificity	
Atkin 1975b	Self-rep'd	K, B, B2	C	Y				Y	Y	5 because more than one measure of effect, 6 because different exposures
Bolton 1983	Parent-rep'd	B, D	C	Y				Y		5 cause more than one measure of effect
Borzekowski & Robinson 2001	Actual	P	Exp	Y	Y					
Cantor 1980	Actual	B2	Exp	Y	Y				Y	6 because different exposures
Clarke 1984	Actual	P	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Coon et al 2001	TV-view	D	C	Y				Y		5 because more than one measure of effect
Dawson et al 1988	Actual	B2	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Dietz & Gortmaker 1985	TV-view	D	C	Y	Y		Y	Y	Y	4 because different levels of exposure examined, 6 because different exposures, 5 because different effects
French et al 2001	Actual	B	Exp	Y	Y		Y			4 because different levels of exposure examined
Galst & White 1976	Actual	B	Exp	Y	Y				Y	6 because different exposures
Galst 1980	Actual	K, B2	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Goldberg 1990	Actual	B	Q-Exp	Y	Y		Y	Y	Y	4 because different levels of exposure examined, 6 because different exposures, 5 because different effects
Goldberg et al 1978a, Goldberg et al 1978b (Study 1)	Actual	K, P	Exp	Y	Y		Y	Y	Y	4 because experiment involves two doses in two conditions, 5 because more than one measure of effect, 6 because different exposures
Goldberg et al 1978a, Goldberg et al 1978b (Study 2)	Actual	K, P	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Gorn & Florsheim 1985	Actual	P	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Gorn & Goldberg 1980a	Actual	P, B2,	Exp	Y	Y		Y	Y		4 because different levels of exposure examine, 5 because more than one measure of effect
Gorn & Goldberg 1980b and 1982	Actual	B2, O	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Gracey et al 1996	TV-view	K, D	C	Y				Y	Y	6 because different exposures, 5 because different effects
Heslop & Ryans 1980	Actual	P	Exp	Y	Y			Y		5 because more than one measure of effect
Jeffrey et al 1982 (Study 1)	Actual	P, B2	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Jeffrey et al 1982 (Study 2), Fox 1981	Actual	K, P, B2	Exp	Y	Y			Y	Y	5 because more than one measure of effect, 6 because different exposures
Kaufman & Sandman 1983	Actual	P	Exp	Y	Y		Y			4 because different levels of exposure examined
Lewis & Hill 1998 (Study 2)	Actual	O	Exp	Y	Y			Y		5 because different effects in different subgroups
Norton et al 2000	Self-rep'd	P	Exp	Y	Y			Y		5 because more than one measure of effect
Peterson et al 1984	Actual	K, P, B2	Exp	Y	Y			Y	Y	5 because more than one measure of effect, S because different exposures
Reeves & Atkin 1979	TV-view	B	Obs	Y					Y	6 because different exposures
Ritchey & Olson 1983	TV-view	P, B2	C	Y					Y	6 because different exposures
Ross et al 1980 and 1981	Actual	K	Exp	Y	Y		Y			4 because experiment involves increasing the exposure dose with time
Stoneman & Brody 1981	Actual	P	Exp	Y	Y			Y		5 because more than one measure of effect and in different subgroups
Stoneman & Brody 1982	Actual	B	Exp	Y	Y					
Taras et al 1989	Parent-rep'd	B, D	C	Y			Y	Y	Y	4 because different levels of exposure examined, S because different exposures, C because different effects
Wiman & Newman 1989	Self-rep'd	K	C	Y			Y			4 because different levels of exposure examined
Wong et al 1992	TV-view	D	C	Y					Y	6 because different exposures

Key to Table:

K= knowledge, P = preferences, B = food purchasing behaviour, B2 = food consumption behaviour, D = diet and health, O = other.
Exp = Experimental; Q-Exp = Quasi-experimental; C = Cross-sectional; O = Observational

Q2: (1) Does food promotion influence children's nutritional knowledge?

Studies Under Review

Eight studies investigated the effects of food promotion on children's nutritional knowledge. Five were experiments deploying a randomised controlled design (Galst 1980, Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a & 1978b Study 2, Ross et al 1980 & 1981, and Peterson et al 1984), and three were cross-sectional surveys (Wiman & Newman 1989, Gracey et al 1996, Atkin 1975b).

All the studies were conducted in north America apart from Gracey et al (1996), which was conducted in Australia. Respondents in the studies were US kindergarten to grade 6 (Ross et al 1980 & 1981), US grade 4-7 (Atkin 1975b), aged 5-6 (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2, Peterson et al 1984), aged 3-6 (Galst 1980), aged 8-12 (Wiman & Newman 1989), and aged 15 (Gracey et al 1996). All the experimental studies had a randomly allocated control group and one or more randomly allocated experimental conditions. The control condition in one of the experiments (Ross et al 1980 & 1981) comprised exposure to non-food adverts; in the other four studies the control condition involved no exposure to any adverts.

As far as could be ascertained (some studies did not report the exact measures taken), the studies took varying measures of nutritional knowledge. Two examined whether exposure to food promotion influenced children's perceptions of how 'healthy' different foods are (Galst 1980, Goldberg 1990). One examined beliefs about whether specific breakfast foods were 'good' or 'not good' for you and about the nutritional value of sugar (Atkin 1975b), one examined whether exposure to food promotion affected children's ability to discriminate whether food products contain real fruit (Ross et al 1980 & 1981), and two examined whether exposure to food promotion influenced children's nutritional knowledge (Wiman & Newman 1989, Peterson et al 1984). Wiman & Newman (1989) also assessed the impact on understanding of nutritional phraseology.

The food promotion stimuli in the experimental studies were adverts for cereals and soft drinks (Ross et al 1980 & 1981), branded sugared snacks and breakfast cereals (Goldberg et al 1978a & 1978b Study 1), 'sugared foods' (Galst 1980, Goldberg et al 1978a & 1978b Study 2), and 'pronutrition foods' (Peterson et al 1984). Goldberg et al (1978a & 1978b Study 2) measured whether the effect of a 'pro-nutritional television programme' was modified by being shown alongside adverts for sugared foods versus alongside nutritional PSAs. In the Peterson et al (1984) study, the experimental stimulus was children's television programmes with a healthy eating theme plus five minutes of commercials or PSAs promoting "healthy eating habits and foods high in nutritional value". In other words, food promotion was not examined in isolation from other messages. The food adverts are not described in the study.

Two of the three cross-sectional studies used reported television viewing as the measure of exposure to food promotion. Wiman & Newman (1989) examined television viewing at different times of the week (Saturday morning, weekday afternoon and weekday evening) in order to assess any differences associated with exposure to child-oriented commercials, whereas Gracey et al (1996) simply took a general measure of reported hours of viewing per week. Atkin (1975b) measured exposure using a 'cereal advertising exposure index' and a 'candy advertising exposure

index'. These were created by multiplying respondents' reported amount of Saturday morning television viewing by their reported frequency of paying attention to adverts for the two types of products. The issues involved in using television viewing as a measure of food promotion exposure are discussed in the Discussion section below.

The studies are described in full in the data extraction sheets in Appendix 10.

Findings

Of the eight studies, four found that exposure to food promotion had a significant impact on or was associated with significant changes in children's nutritional knowledge and perceptions. Two of these were experiments (Ross et al 1980 & 1981, Peterson et al 1984) and two were cross-sectional (Wiman & Newman 1989, Gracey et al 1996). Three studies found that exposure to food promotion had no significant impact on or was not associated with significant changes in children's nutritional knowledge and perceptions. Two of these were experiments (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2) and one was cross-sectional (Atkin 1975b). In the eighth study (Galst 1980), it was difficult to separate out the effects of food advertising from other experimental influences examined in the study, and the results are therefore inconclusive.

Not all studies provided information on the exact knowledge measures taken. This makes it difficult to group the findings thematically according to effects on different types of knowledge. The studies are simply, therefore, grouped below into those which appeared to take relatively more detailed knowledge measures and those which appeared to take simpler, less precise knowledge measures.

(i) Detailed Knowledge Measures

Four studies took relatively detailed measures of nutritional knowledge.

Ross et al (1980 & 1981) examined whether exposure to food adverts affected primary school age children's ability to discriminate correctly whether actual food products contained fruit or not. Respondents (aged US kindergarten grade to grade 6) were asked to decide whether different food products contained real fruit, artificial fruit flavour, or no fruit both before and after exposure to cereal and soft drink adverts. Some of the products were featured in the adverts and some were not. After viewing the adverts 'intensively' (ie. shown without an accompanying television programme), correct ratings of the products which contained artificial fruit flavour decreased in children exposed to the adverts and increased in control group children not exposed to the adverts ($F(1,87) = 5.97, p < 0.05$). Consistent effects in the direction of misjudging the fruit content of artificial fruit products were found when comparing the experimental group's ratings post-experiment with their baseline ratings, the experimental group's ratings for advertised products with their ratings for non-advertised products, and the experimental group's ratings with the control group's ratings for the same products. Effects were not found when the adverts were shown 'naturalistically', ie. embedded in a television programme. However, the study presents incomplete data, and does not fully describe the statistical analyses conducted, therefore its results should be treated with caution.

Peterson et al (1984) found that exposure to a combination of programming, Public Service Announcements and adverts for 'foods high in nutritional value' significantly increased the nutritional knowledge ($F(1,4) = 24.48, p < 0.01$) of children aged 5-6, when compared with a control group not exposed to the experimental stimulus materials. Respondents were asked two series of questions designed to test general nutritional knowledge and learning of the specific nutritional concepts presented in the programming and adverts. No treatment effect was found on the set of knowledge questions designed to test general nutritional knowledge. Analysis of variance on the measures relating to specific nutritional concepts found that a significant main effect for trials was obtained ($F(1,4)=55.00, p < 0.001$) and that a significant treatment by trials interaction was also obtained ($F(1,4)=24.48, p < 0.01$), suggesting that exposure to the programming and high nutrition food adverts increased specific nutritional knowledge. However, the specific influence of the food adverts, as opposed to the programmes and PSAs, cannot be measured in this study design, and the findings should therefore be treated with caution/are of only limited relevance.

Two cross-sectional surveys examined the relationship between reported television viewing and nutritional knowledge. Wiman & Newman (1989) measured 8-12 year olds' nutritional knowledge using a 13-item true-false test taken from grade-appropriate school textbooks, and their understanding of 'nutritional phraseology' using a 7-item test (eg. *'If a commercial for Trix says "Trix tastes like fruit and looks like fruit too", this means: a. if you eat Trix you don't need to eat fruit, b. Trix is made of fruit, c. Trix has the colour and flavour that an apple or pear might have'*). The study found that more frequent viewing of television at a child-oriented programming period, Saturday morning, correlated negatively with nutritional knowledge ($r = -0.116, p < 0.05$) and 'understanding of nutritional phraseology' ($r = -0.113, p < 0.05$) in 8-12 year old children. The study took an extensive measure of television viewing, assessing viewing at different times of day in some detail, which meant that potential exposure to different levels of child-orientated advertising could be analysed. Gracey et al (1996) found that reported amount television viewing correlated negatively with nutritional knowledge measured in an 8-item test ie. the more viewing, the poorer knowledge ($r = -0.117, p = 0.028$) in 15-16 year old children. However, the study took only a simple measure of television viewing (hours spent watching at weekdays and weekends), which is a less reliable indicator of potential exposure to child-oriented food advertising than would be a measure of television viewing at periods when child-oriented food advertising features heavily, such as Saturday mornings.

(ii) Simple Knowledge Measures

Four studies took relatively simple knowledge measures (as far as could be ascertained from the information provided), such as perceptions of the healthiness of different foods. Two studies by Goldberg et al (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2) found that exposure to adverts for sugared foods had no effect on 5-6 year old children's ability to rate correctly whether 36 different foods were 'good for you and healthy' or 'bad for you and not healthy'.

One cross-sectional study (Atkin 1975b) found no correlation between exposure to cereal or confectionery advertising and 4-7th grade children's beliefs about the nutritional value of specific breakfast foods, or on their beliefs about the nutritional value of sugar.

The final experimental study (Galst 1980) found that 3-6 year old children exposed to adverts for added sugar foods and to nutritional advice from an adult had more accurate perceptions of the healthiness and sugar content of a range of snack foods than did children exposed to the same adverts without adult advice, children exposed to adverts for non-added sugar foods both with and without adult advice, and control group children. The study design did not permit the separation of the different advertising and advice influences, so it is difficult to assess the effect of the advertising element in this study, and the results should therefore be treated as inconclusive.

Discussion

Methods

The studies covered a wide age, 3-16. All but one of the studies were conducted with North American samples in the 1970s and 1980s.

The studies were generally of reasonable quality. All the experimental studies randomly allocated subjects to experimental and control conditions. However, four of the experiments did not take a baseline measure of knowledge, so it is impossible to ascertain whether experimental and control groups differed in nutritional knowledge before the experiment.

Two studies (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2) were higher scoring in terms of quality, while six studies (Atkin 1956, Galst 1980, Gracey et al 1996, Peterson et al 1984, Ross et al 1980 & 1981, Wiman & Newman 1989) were medium scoring in terms of quality. However, in the Galst (1980) and Peterson et al (1984) studies, it was not possible to separate out the potential effects of the food advertising from other experimental stimuli examined at the same time: the absence or presence of adult nutritional advice in Galst (1980), and the presence of nutritional programming and PSAs in the Peterson et al (1984) study. These studies are therefore of limited value compared to studies where the stimulus materials were manipulated in such a way as to isolate the effects of food promotion from other exposure variables.

The food knowledge measures taken in three studies (Galst 1980, Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2) were relatively simple - ratings of whether foods are 'good' or 'bad' for you. To some extent the measures taken in these studies may reflect the young age of the samples; the studies which took more detailed knowledge measures also tended to involve older respondents. It is possible that effects are more likely to be found where a more precise/detailed measure of food knowledge is taken as opposed to a simpler measure such as perceptions of what is healthy and unhealthy, although more evidence would be needed to support this conclusion. At the very least, the heterogeneity across the studies in food knowledge measures taken and in respondent age makes synthesis across the experimental studies difficult.

The cross-sectional studies were medium scoring in terms of quality. A weakness of the cross-sectional studies was the use of television viewing as a proxy measure of exposure to food promotion (see the Introduction to Q2 above). In this respect, the Wiman & Newman (1989) study, which measured Saturday morning viewing, used a more useful measure of potential exposure than did Gracey et al (1996), which measured aggregate viewing across the week. Atkin (1975b) attempted to generate a more precise measure by combining self-reported viewing of specific programmes with a measure of self-reported frequency of paying attention to adverts for specific products.

All three studies calculated only correlation coefficients, rather than conducting regression analysis, to analyse the relationship between food promotion and nutritional knowledge. Correlations simply show association with no account for cofounders. Causality cannot be assumed as there may well be confounding variables that account for variation in nutritional knowledge. Atkin (1975b) calculated fourth order correlation coefficients enabling the effects of grade, gender, socio-economic status, and school performance to be controlled for and Wiman & Newman (1989) adjusted for age. The studies would have been stronger had they used multiple regression analysis to examine the relationship between food promotion and other factors on knowledge. While the multiple regression approach would still only have identified association rather than causation it would have enabled the effect of food promotion to have been assessed independently of several other potential influences on nutritional knowledge. Two of the studies found an association between television viewing and nutritional knowledge (Wiman & Newman 1989, Gracey et al 1996), and one did not (Atkin 1975b).

Findings

The eight studies reviewed produce mixed evidence, although overall the evidence that food promotion has an effect on children's nutritional knowledge appears slightly stronger than the evidence that it does not. Four studies found that food promotion had an effect on or was associated with differences in nutritional knowledge. Three of these four studies provided evidence that exposure to food promotion for 'low nutrition' foods was associated with *poorer* nutritional knowledge. Of these, one was an experiment providing causal evidence (Ross et al 1980 & 1981) and the other two (Wiman & Newman 1989, Gracey et al 1996) were cross-sectional studies. The fourth study, an experiment (Peterson et al 1984), found that exposure to adverts for foods "high in nutritional value" *increased* nutritional knowledge, although it was impossible to separate out the effects of the adverts from other nutritional messages in this study.

Three studies found that exposure to food promotion had no impact on children's perceptions of the healthiness of different foods or what constitutes a healthy diet. Two were experimental (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2) and one was cross-sectional (Atkin 1975b). The eighth study produced inconclusive results (Galst 1980)

It is difficult to draw firm conclusions from the studies addressing this question. In two of the studies (one of which showed an effect and one where the results were inconclusive) it was difficult to separate out the effects of advertising from other exposure variables (Peterson et al 1984, Galst

1980); furthermore, studies which found effects tended to take more detailed knowledge measures than did the studies which did not find effects: the studies were not measuring the same effect.

Given the caveats above, the weight of evidence would seem to suggest that food promotion is unlikely to influence general perceptions of what constitutes a healthy diet, but that it can, in certain contexts, have a modest effect on certain types of nutritional knowledge.

Q2: (2) Does food promotion influence children's food preferences?

Studies Under Review

Fourteen studies investigated whether food promotion influenced children's food preferences. Thirteen were experiments (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a & 1978b Study 2, Peterson et al 1984, Stoneman & Brody 1981, Gorn & Florsheim 1985, Gorn & Goldberg 1980a, Kaufman & Sandman 1983, Borzekowski & Robinson 2001, Jeffrey et al 1982 Study 1, Jeffrey et al 1982 Study 2/Fox 1981, Clarke 1984, Heslop & Ryans 1980, Norton et al 2000), and one was cross-sectional (Ritchey & Olson 1983). Twelve of the experimental studies used a similar design, involving exposing one or more experimental groups to one or more food promotion stimuli, and eleven of them compared children's subsequent food preferences or attitudes to those of a control group exposed to different or no stimuli; the twelfth study had no control but involved eight different experimental groups in which the level of exposure to food promotion was varied, along with other characteristics of the viewing stimulus and context (Clarke 1984). In the thirteenth study (Norton et al 2000), respondents sampled a range of foods, rated their degree of liking for each food, then completed a questionnaire in which they assessed the perceived strength of different motivational influences on their preferences for each food.

Subjects were all North American, and ranged in age from pre-school to 18 years: pre-school children (and their parents) (Ritchey & Olson 1983), 2-6 year olds from low income backgrounds (Borzekowski & Robinson 2001), 4 year olds (Clarke 1984), 4-5 year olds (Jeffrey et al 1982 Study 1), 4-5 and 9-10 year olds (Jeffrey et al 1982 Study 2/Fox 1981), 4-8 year olds from middle and upper income backgrounds (Heslop & Ryans 1980), 5-6 year olds (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2, Peterson et al 1984), 5-10 year olds (Kaufman & Sandman 1983), 4th graders (Stoneman & Brody 1981), 8-10 year old boys (Gorn & Goldberg 1980a), and 9-10 year old girls (Gorn & Florsheim 1985). Norton et al (2002) interviewed 35 white middle class adolescents aged 9-18, each of whom was one member of a pair of twins.

The food promotion stimuli in the experimental studies were adverts for branded sugared snacks and breakfast cereals (Goldberg et al 1978a & 1978b Study 1), non-specific 'sugared foods' (Goldberg et al 1978a & 1978b Study 2), salty snacks (Stoneman & Brody 1981), sweets and soft drinks (Kaufman & Sandman 1983), Pepsi, Fritos and Hersheys chocolate (Jeffrey et al 1982 Study 1), a lemon-flavoured drink (Clarke 1984), cereal (Heslop & Ryans 1980), ice cream (Gorn & Goldberg 1980a), and adverts for 'pronutrition foods' (Peterson et al 1984, Jeffrey et al 1982 Study 2/Fox 1981). Gorn & Florsheim (1985) were interested in how pre-adolescent girls responded to age-inappropriate products, and exposed subjects to adverts for lipstick and diet drinks, designating the

former a product the respondents were likely to envisage themselves using in the next few years, and the latter a product they were unlikely to envisage themselves using in the next few years. Some studies compared the effects on food preferences of 'low nutrition' food promotion with the effects of 'pro nutrition' food promotion (Jeffrey et al 1982 Study 1, Jeffrey et al 1982 Study 2/Fox 1981) or with dietary PSAs (US Public Service Announcements) (Goldberg et al 1978a & 1978b Study 1 & Study 2).

Six studies measured whether different modifications to the experimental stimuli weakened or strengthened their effects on food preferences. Kaufman & Sandman (1983) measured whether the effects of adverts for sugared foods were modified when the adverts were accompanied by counter adverts with the message 'don't eat so much sweet stuff' or by disclaimers warning that the product was 'bad for your teeth, your healthy, bad for you'. Stoneman & Brody (1981) measured whether the effects of adverts for salty snacks were modified by the presence alongside the experimental subject of a same age peer who either endorsed or rejected the snacks depicted in the adverts. Goldberg et al (1978a & 1978b Study 2) measured whether the effect of a 'pro-nutritional television programme' was modified by being shown alongside adverts for sugared foods versus alongside nutritional PSAs. Heslop & Ryans (1980) measured whether cereal adverts which placed different amounts of emphasis on a free gift had differential effects on preferences. Clarke (1984) examined whether response to adverts for a lemon-flavoured drink was modified by different amounts of exposure to the adverts (once or four times), by whether the adverts were preceded by an enjoyable or unenjoyable television programme, and by whether food was served or not served during viewing. Gorn & Goldberg (1980a) were interested in the effects of repetition and variety, and exposed children to one, three or five repetitions of an advert for a specific ice cream, and also to three and five different adverts for the same ice cream.

The studies measured both brand and product preferences. Five of the studies asked children to pick between products in different categories (lower fat, sugar or salt versus higher fat, sugar or salt) (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2, Stoneman & Brody 1981, Kaufman & Sandman 1983, Peterson et al 1984). Five of the studies asked children to choose between different brands of the same product, one or more of which had been advertised on the experimental tape and one or more of which had not (Borzekowski & Robinson 2001, Clarke 1984, Heslop & Ryans 1980, Gorn & Florsheim 1985, Gorn & Goldberg 1980a). Two of the studies measured product preferences but between alternatives that were not necessarily designated healthier and less healthy: Gorn & Florsheim (1985) asked pre-adolescent girls to choose from a diet drink (which had been advertised), coffee, soft drink, milk and sugared drink, while Gorn & Goldberg (1980a) asked children to indicate their favourite snack food from a list containing the advertised product, ice cream.

Food preferences were typically measured in the studies by asking children to choose one from a pair of foods or from a larger number of foods. Foods were typically mounted on a board, or depicted in photographs/slides or a line drawing. Norton et al (2000) asked subjects to indicate how much of an influence seven different motivational factors ('healthfulness', parents serving the food, peers eating the food, accessibility, price, taste and television advertising) were on their food preferences, and correlated these with preferences (degree of liking for foods) measured in an actual eating test. The cross-sectional study (Ritchey & Olson 1983) measured amount of television watching by the child as reported by the parent, and correlated this with a range of measures

including food preferences. Preferences were assessed by asking children to indicate their degree of liking for 22 foods displayed in photographs.

Findings

Two studies measured but did not report data on the effect of food promotion on degree of liking for foods (Jeffrey et al 1982 Study 1, Jeffrey et al 1982 Study 2/Fox 1981). Of the twelve studies that did report results, seven (six experiments and one cross-sectional study) found that the exposure to food promotion had an impact on, or was associated with significant changes in, children's food preferences (Goldberg et al 1978a & 1978b Study 1, Gorn & Goldberg 1980a, Stoneman & Brody 1981, Kaufman & Sandman 1983, Borzekowski & Robinson 2001, Heslop & Ryans 1980, Norton et al 2000). One found non-significant results in the direction of an effect (Goldberg et al 1978a & 1978b Study 2), and four (three experiments and one cross-sectional study) found no significant effects or associations (Peterson et al 1984, Clarke 1984, Ritchey & Olson 1983, Gorn & Florsheim 1985).

Findings from the studies are reported thematically under four headings: preferences between different brands, preferences between 'healthier' and 'less healthy' product types, preferences between different products, and general preferences.

(i) Preferences Between Different Brands

Five experimental studies examined whether exposure to food promotion caused children to prefer the advertised brand over a non-advertised brand in the same product category (Borzekowski & Robinson 2001, Clarke 1984, Heslop & Ryans 1980, Gorn & Florsheim 1985, Gorn & Goldberg 1980a). Borzekowski & Robinson (2001) found that exposure to adverts for a range of child-oriented food products significantly increased the likelihood of 2-6 year old children choosing the advertised food over a non-advertised similar product. After exposure to eight adverts for foods frequently advertised on children's television and one toy car advert, experimental group children were more likely than control group children to (had higher odds ratios) select the advertised brand in seven out of nine instances, when presented with the advertised and a non-advertised similar product. The two exceptions were the breakfast cereal, where both experimental and control groups preferred the advertised product, and the toy, where experimental children were not more likely to select the advertised product. Two adverts were shown twice on the tape, and these produced the biggest difference between groups (the experimental group was three times more likely than the control group to prefer the advertised product), suggesting an additional effect of exposure intensity.

Heslop & Ryans (1980) exposed equal number of 4-6 and 7-8 year olds to three different versions of cereal adverts. The three versions placed no, some and heavy emphasis on a free gift. Half the respondents exposed to each advert saw it once and half saw it three times. After exposure, children and their mothers (who had not seen the adverts) were invited to select one of three brands (one of which had been advertised) for each of five products. Children exposed to any of the cereal adverts, regardless of emphasis on free gifts and number of exposures, were more likely than the control group children (who had been shown a public service announcement) ($p=0.06$) to state in an

interview that they preferred the advertised brand. However, the level of significance ($p=0.06$) would not be considered significant by current conventions. On the two other preference measures (mother's report of child's actual selection, and the observed actual selection), exposure to the adverts had no effect. The relative emphasis placed on the free gift had no significant impact on any of the preference measures, nor did frequency of exposure make a significant difference.

Clarke (1984) examined the impact of food promotion on brand preference for a single food product, a lemon-flavoured drink. Exposure to adverts for a brand of lemon-flavoured drink had no effect either on brand or flavour preferences, regardless of whether the advert was shown once or four times, whether the preceding programme was enjoyable or unenjoyable, and whether or not food was served during screening.

Gorn & Florsheim (1985) found that exposure to advertising for a brand of diet drink had no effect on 9-10 year old girls' brand preferences when asked to select a diet drink for themselves or for a female teacher. The hypothesis of the study was that the advertising would have no impact because the product was deemed inappropriate and lacking in salience for that age group.

Gorn & Goldberg (1980a) exposed experimental groups of children to either one, three or five repetitions of an advert for a specific ice cream, three or five different adverts for the same ice cream, or no adverts. Analysis of variance indicated that all experimental conditions had an effect on children's brand preference for the advertised brand over other brands ($F=2.59$, $df = 5, 105$; $p<0.05$). Newman-Keuls post hoc analysis indicated that those who viewed three different adverts had significantly greater preference for the advertised brand than did those who viewed only one advert ($p<0.01$). The preference scores for all other experimental groups fell in-between and no other significant differences were observed between any of the experimental groups.

(ii) Preferences Between Product Types in Different Categories

Five experimental studies examined whether exposure to food promotion caused children to prefer higher fat, sugar or salt products over lower fat, sugar or salt alternatives (Goldberg et al 1978a & 1978b Study 1 & Study 2, Stoneman & Brody 1981, Kaufman & Sandman 1983, Peterson et al 1984). The first Goldberg et al (1978a & 1978b Study 1) study asked 5-6 year old children to select snack and breakfast foods from boards depicting both 'more wholesome', lower in glucose, higher nutrient value foods and 'less wholesome', high glucose, lower nutrient value foods. Those exposed to adverts for sugared foods before the selection test selected significantly more sugared foods, when presented with the boards, than did children exposed to nutritional Public Service Announcements (12.58 vs. 8.70²), and there was a significant main effect on the number of sugared foods selected for sugared food adverts versus PSAs ($F=7.47$, $df=1,57$, $p<0.01$). A similar study by the same authors took the same food preference measures after exposure to a nutritional programme alone or followed by either adverts for added sugar foods, or nutritional PSAs (Goldberg et al 1978a & 1978b Study 2). Children exposed to the programme and sugared food adverts subsequently preferred a greater number of sugared foods than children exposed to the nutritional programme without the food adverts or to PSAs, but the difference was not significant.

² The p-value is not reported in the article.

Stoneman & Brody (1981) found that 5-6 year old children exposed to adverts for salty snacks selected more salty snacks in a food preference test than a control group exposed to no adverts (5.35 vs. 3.75, $p < 0.01$), and that this effect was further reinforced when children were also exposed to a same age peer selecting the salty snack from each pair of foods; the effect was reduced, however, when the peer selected the non-salty snack. The study does not describe the 'common foods' used as alternatives to salty snacks.

Kaufman & Sandman's (1983) experiment with 5-10 year old children found that four different advertising exposure conditions had a significant influence on food preference scores when the influence of geographic area and pre-test food scores were controlled for in an analysis of covariance ($p < 0.01$). They reported that, at post-test, children exposed only to the sugared food adverts made fewer 'healthy food choices' (adjusted mean 49.76) than respondents in other conditions, children exposed to the counter-adverts (whether accompanied by sugared food adverts or not) made the most 'healthy food choices' (counter-adverts alone 61.40, counter-adverts plus sugared food adverts (60.93) and children exposed to the sugared food adverts with disclaimers fell between these groups (56.69). However, they did not report any levels of statistical significance to identify which group differences were significant. The fifth study in this group, Peterson et al 1984, found that exposure to a combination of nutrition programmes, nutrition PSAs and adverts for 'foods high in nutritional value' did not increase the likelihood of children selecting high nutrition foods over low nutrition foods in a complex series of food preferences tests.

(iii) Preferences Between Different Products

Gorn & Florsheim (1985) found that exposure to advertising for a brand of diet drink had no effect on 9-10 year old girls' preferences (from a range of coffee, soft drink, diet, drink, milk and sugared drink) when asked to select a drink for themselves or for a female teacher. The hypothesis of the study, which was supported, was that the advertising would have no impact because the product was deemed inappropriate and lacking in salience for that age group.

Gorn & Goldberg (1980a) measured children's choice from a range of snack foods after exposure to either one, three or five repetitions of an advert for a specific ice cream, three or five different adverts for the same ice cream, or no adverts. There were no significant differences between any of the groups with regard to first choice for a food snack (generic preference). However, children exposed to five different adverts were significantly more likely to select ice cream as their second choice (45% made this selection), compared with 10-15% in the other conditions ($p < 0.05$).

(iv) General Preferences

Norton et al (2000) asked 9-18 year olds to rate the strength of different motivational influences on their preferences for 17 different foods, after tasting these foods and rating their degree of liking for each. The seven motivational influences were 'health fullness', parents serving it, peers eating it, price, accessibility, taste and television advertising. Simple correlations indicated that television advertising was significantly associated with degree of preference for one food, chicken, and

stepwise regression suggested that television advertising had a significant influence on preference for three food items (apples, beans and low fat milk). In comparison, taste had a significant influence on preference for 16 food items; parents serving, accessibility and peers eating on preference for two items each; 'healthfulness' on one item; and price on no items. The reliance on measures of self-reported influence and the absence of a measure of exposure to food advertising limit this study's usefulness.

Finally, the cross-sectional study (Ritchey & Olson 1983) examined the relationships between pre-school children's ratings of 22 different foods in a simple preference test (children had to point to a smiling, neutral or frowning face) and various measures obtained in a questionnaire survey conducted with their parents. The measures were parental food attitudes and behaviours [such as giving of sweet foods], child's sweet food consumption, child's television watching and socio-demographic characteristics. Correlation coefficient analysis found few consistent relationships between the variables, and multiple regression analysis found no significant relationship between television watching or parental attitudes and behaviours and children's food preferences.

Discussion

Methods

The studies covered a wide age range, 2-18, although the majority were conducted with primary school age children. The majority of the studies were conducted in the 1980s, and all were North American.

The experimental studies were generally of good quality. All involved random allocation to experimental conditions, and all but one involved a control (in the remaining study, Clarke (1984), there were eight different experimental conditions reflecting different levels of exposure to food adverts in different viewing contexts).

Four experimental studies were higher scoring in terms of quality (Kaufman & Sandman 1983, Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a & 1978b Study 2, Stoneman & Brody 1981). Kaufman & Sandman (1983) was a well-conducted study with a large sample (n=1,108), comprising all pupils in public schools in three cities. Food preferences were measured both before and after exposure to food promotion, and appropriate co-variate analysis was conducted to account for baseline differences. A relatively large impact of sugared food adverts on food preferences was found, and the size of the effect, combined with the large and mixed sample, suggests that this study's findings should be given some weight. However, the study would have been strengthened had observed behaviour rather than stated preferences been measured. The two Goldberg et al (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a & 1978b Study 2) studies were well-conducted and designed. The study which compared the impact of sugared food adverts with a nutritional PSA found a significant effect on preferences (Study 1), while the study which compared the impact of a nutritional programme modified in different ways, including the addition of sugared food adverts, did not find significant effects (Study 2). Stoneman & Brody (1981) involved random allocation of equal numbers of black and white children to each of four experimental conditions. The analysis was appropriate with a 4 x 2 factorial analysis of variance,

with Newman-Keuls post hoc comparisons utilised to examine the influence, on snack behaviour, of adverts only and adverts combined with peer modelling.

The remaining five experimental studies (Borzekowski & Robinson 2001, Gorn & Florsheim 1985, Gorn & Goldberg 1980a, Heslop & Ryans 1980, Peterson et al 1984) were medium scoring in terms of quality. Borzekowski & Robinson (2001) was one of the few studies to examine effects on low income children. Although a small sample, all children in the study population (a nursery school) were eligible for inclusion, and subjects were randomly allocated to experimental and control groups. The Cochran Q Statistic was used to test whether exposure to food commercials influenced food preferences and Student t and Chi-square tests were also used to compare control and treatment groups for significant differences in demographic characteristics and media use. The analysis was adequate given that the randomisation resulted in comparable treatment groups. In Gorn & Goldberg (1980a), the design permitted analysis of the potential effects of exposure to varying degrees of advert repetition and to varied sets of adverts for the same product. It examined the effect of one, three and five exposures to a particular advert as well as exposure to three different and five different adverts for the same product, and a control group was studied to examine results in relation to no advertising exposure.

Two of the experimental studies (Gorn & Florsheim 1985, Peterson et al 1984) were relatively well-conducted but their results were, for various reasons, of limited relevance to the review question. The Gorn & Florsheim (1985) study measured product and brand preferences in relation to a food product which the authors deemed to be of little current or future salience to the pre-adolescent sample, rather than in relation to a product intentionally targeted at, or consumed by, the study age group. It is possible that diet drink advertising might have more relevance to a pre-adolescent female target group now than in the early 1980s when the study was conducted. However, given the study's intentional focus on 'adult' products, the results from this study are probably of limited relevance to this particular review question. In Peterson et al (1984), it was not possible to separate out the potential effects of the food advertising from other experimental stimuli examined at the same time (nutritional programming and PSAs). Again, this limits the study's usefulness to the review question.

Heslop & Ryans (1980) was a medium scoring study, although it had a poor response rate (13%). The use of fixed effects ANOVA appeared to be appropriate for the study design (3x2x2 factorial plus controls).

Two of the experimental studies were lower scoring (Clarke 1984, Norton et al 2000). Clarke (1984) was a rather complicated study, in which subjects effectively participated in two experiments, and a large number of dependent measures were tested. The statistical analysis was poorly described. The primary focus of the study was the effects of advertising repetition, rather than of food advertising per se, and the study took only one preference measure relevant to this review, brand preference in relation to a single product (a lemon-flavoured drink). Norton et al (2000) was one of the weaker studies as it relied on self-reported measures of the effects of food promotion (asking subjects how much of an influence they felt television had on their food preferences).

The cross-sectional study, Ritchey & Olson (1983), was also lower scoring in terms of quality. The study provided only limited information on sample selection or response rate. As discussed in the Introduction to Q2, the use of television viewing as a proxy measure of exposure to food promotion is potentially problematic. The usefulness of the measure can be improved by taking specific measures of television viewing at times of the week characterized by heavy child-oriented advertising, such as Saturday mornings. However, the television viewing measure used in this study was not described, so it was not possible to judge what level of potential exposure was measured. There were inconsistencies in parental and child reporting of child food preferences within the study, and the authors themselves suggested that the preferences measure used was possibly not sensitive enough to detect differences between children.

Findings

Of the four higher scoring experimental studies, three found that food promotion had significant effects on children's product and brand preferences (Kaufman & Sandman 1983, Goldberg et al 1978a & 1978b Study 1, Stoneman & Brody 1981). Goldberg et al (1978a & 1978b Study 1), Stoneman & Brody (1981), and Kaufman & Sandman (1983) found that children were more likely to choose high fat, salt or sugar foods than alternative 'healthier' products after exposure to food adverts. In Goldberg et al (1978a & 1978b Study 1), children were more likely to select less wholesome, high glucose and lower nutrient value foods than more wholesome, lower glucose, high nutrient value foods; in Kaufman & Sandman (1983), children were more likely to select highly sugared generic foods (eg. cake, soda) than less sugared generic foods such as oranges or popcorn; and in Stoneman & Brody (1981) they were more likely to select a salty snack than another "common food", although the "common foods" are not described. The fourth higher scoring experimental study (Goldberg et al 1978a & 1978b Study 2) did not find significant effects.

Of the five medium scoring experimental studies, three found that that food promotion had effects on children's product and brand preferences (Borzekowski & Robinson 2001, Gorn & Goldberg 1980a). Borzekowski & Robinson (2001) found that children were more likely to choose the advertised brand than a non-advertised brand of the same product type after exposure to food adverts. Gorn & Goldberg (1980a) found that food promotion had an effect, on children's brand and to a lesser extent product preferences. Heslop & Ryans (1980) found that children exposed to cereal adverts were slightly more likely to prefer the advertised brands. The other two adequate quality studies (Gorn & Florsheim 1985, Peterson et al 1984) did not find effects.

Of the two lower scoring experimental studies (Clarke 1984, Norton et al 2000), the former found no significant effects, while the latter found slightly stronger effects: television advertising was reported to be a significant influence only on degree of liking for three products which are generally not heavily advertised on television: chicken, apples, beans and low fat milk. Similarly, the lower scoring cross-sectional study (Ritchey & Olson 1983) found no significant associations between food promotion and food preferences. Finally, the two Jeffrey et al studies (1982 Study 1; 1982 Study 2/Fox 1981) did not report results.

Overall, the stronger studies were more likely to find effects and the less strong studies were not, suggesting that there is reasonably robust evidence that food promotion influences food preferences.

Taken together, the studies provide evidence for both brand and category effects. This is examined in more detail in Q3 below.

Q2: (3) Does food promotion influence children's food purchasing and purchase-related behaviour?

Studies Under Review

Seven studies examined the impact of food promotion on children's food purchasing and purchase-related behaviour. Three were randomized controlled experimental studies (French et al 2001, Stoneman & Brody 1982, Galst & White 1976), one was a natural quasi-experiment deploying complex analysis (Goldberg 1990), one was an observational study (Reeves & Atkin 1979), and two were cross-sectional surveys (Atkin 1975b, Taras et al 1989).

The samples in the studies were 475 9-12 year old English-speaking and French-speaking children in Montreal (Goldberg 1990), 36 3-5 year old children in Georgia and their mothers (Stoneman & Brody 1982), 775 4th – 7th grade children in Michigan (Atkin 1975b), 66 mothers of children aged 3-8 in Californian public 'preschools' and elementary schools (Taras et al 1989), 41 3-11 year old children (mean age range 4-7) in New York and their mothers (Galst & White 1976), 100 children aged 3-13 in Michigan (Reeves & Atkin 1979) and vending machine users in twelve secondary schools and twelve workplaces in Minnesota (French et al 2001).

The studies took different measures of purchasing and purchase-related behaviour. French et al (2001) took a 'hard' behavioural measure, actual sales of snacks from school vending machines. Observed actual behaviour was measured by Stoneman & Brody (1982) and Galst & White (1976), who exposed children to food advertising in an experimental situation and then observed their attempts to influence selection of products and brands in a natural situation (while shopping with their mothers). Reeves & Atkin (1979) also observed children's behaviour while shopping, but the children had not previously been exposed to food advertising; instead, their television advertising exposure in general and immediately prior to the shopping trip was ascertained by interviewing them in the store. Goldberg (1990) took an imputed measure of household purchasing behaviour, reported purchase of specific brands of cereals in the home.

The cross-sectional studies measured reported behaviour. Taras et al (1989) measured mothers' recall of food products which they felt their children had asked them to buy in the past six months because of television's influence and whether these products were subsequently purchased, and correlated both variables with the child's reported television viewing. Atkin (1975b) measured children's self-reported frequency of requested the purchase of specific cereals, and correlated this with each child's 'cereal advertising exposure'. A score for this was created by multiplying respondents' reported amount of Saturday morning television viewing by their reported frequency of paying attention to cereal adverts.

Findings

All seven studies found that exposure to food promotion had an influence on, or was significantly associated with, the specific purchase-related behaviour measured in each study. The findings are reported thematically according to the type of behaviour measured in each study: sales, observed purchase influence behaviour, household purchase, and reported behaviour.

(i) Sales

One study measured actual purchase behaviour as reflected in sales. French et al (2001) conducted a year-long randomised experimental trial investigating the effects of different pricing and promotion strategies on low fat snack sales from vending machines at 24 sites (12 secondary schools and 12 workplaces). Low fat snacks (defined as those with 3g or less fat per package, and including low-fat 'chips', sweets, pastry, snacks and cookies) were placed in two rows of each vending machine and subjected to 12 different experimental manipulations. These comprised four different levels of low fat snack pricing - (i) Low fat and ordinary snacks same price; (ii) Low fat snacks 10% reduction in price; (iii) Low fat snacks 25% reduction in price; and (iv) Low fat snacks 50% reduction in price – and three different levels of promotion: (i) No specific signage to draw attention to low fat snacks; (ii) labelling of low-fat snacks on the relevant rows; and (iii) labelling of rows plus signs on the vending machine encouraging low fat snack choice. The same price/no signage condition represented a control condition.

Sales of low fat snacks increased significantly and proportionately with increasing price reductions, and promotional labels and signage also had a small, independent effect on low fat snack sales. These effects occurred in both adult (workplace) and adolescent (school) populations. Promotion (labelling and signage) was significantly and independently associated with increased low fat snack sales ($F_{2,44} = 3.48, p < 0.04$). The percentages of low-fat snacks sold in the no signage, labelling, and labelling plus signage conditions were 14.3%, 14.5% and 15.4% respectively. Only the labelling plus signage condition differed significantly from the no signage condition in post hoc means comparisons ($p < 0.05$). The total number of low fat snacks sold did not differ significantly by promotion condition, suggesting that the promotions did not increase the total number of low fat snack sales, only the percentage of snacks sold which were low fat. Overall sales volume was unrelated to promotion, but was related to price reduction.

(ii) Observed Purchase Influence Behaviour

Three studies measured children's observed purchase influence behaviour. Stoneman & Brody (1982) investigated the impact of children's food adverts on mothers' and children's food shopping and purchase-related behaviour as observed in a supermarket after experimental group children had been exposed to adverts for confectionery, salty snacks and soft drinks. Children exposed to the experimental tape engaged in more behaviours intended to influence mothers' purchase selections in general ($X = 43.20$ vs. $X = 28.36, p < 0.01$) and in more behaviours intended to influence mothers' selections in favour of the specific products advertised on the experimental tape ($X = 4.4$ vs. $X = 1.9, p < 0.025$), than did control group children who had not been exposed to the tape. Mothers of children exposed to the experimental tape used more behaviours designed to resist or deflect children's purchase influence behaviours than did mothers of children exposed to the control tape ($X = 4.7$ vs. $X = 2.7, p < 0.05$), and also made more alternative offers in response to children's purchase requests ($X = 2.1$ vs. $X = 2.1$ [sic], $p < 0.025$). No significant difference was found between experimental group and control group children in number of hours of television reportedly viewed per week, and the two groups of children did not differ in the amount of attention they paid

to the experimental tape, which increased the likelihood of the observed differences in behaviour being attributable to the experimental tape.

Galst & White (1976) deployed a similar design, involving 41 'upper middle class' children of both genders aged 3-11 (mean age range 4.7) and their mothers. However, whereas Stoneman & Brody (1982) were interested in any effects of the specific food advertising stimuli on children's subsequent behaviour in a supermarket (ie. did children request the specific products they had seen advertised on the tape?), Galst & White (1976) used the experimental situation to obtain a general measure of children's attentiveness to television and to advertising in particular, which was later correlated in analysis with children observed purchase influence behaviour in a real-life situation. The experimental stimulus comprised a tape of children's television programmes interspersed with commercials (content not described). The television and video equipment were set up so that the tape would run continuously but the respondent had to press a button every four seconds to keep the pictures and accompanying sound on the monitor. The effort exerted by each respondent to keep watching the programme and the commercials - ie. the total amount of time that the child maintained the programme and commercials on the monitor by pressing the button - was defined as the 'television reinforcement value' for that child. A measure was obtained for overall television reinforcement value and separate measures were also obtained for the effort exerted to watch the programme and to watch the commercials. A 'commercial reinforcement ratio' was calculated representing the seconds of commercial time maintained on the screen by the child in relation to the seconds of commercial time available to the child (ie. the total length of time the child watched) and to the programme time watched by and available to the child. After watching the tape, each respondent was observed while shopping at a supermarket with his or her mother, and an observer recorded 'purchase influence attempts (PIA)' - attempts to influence mothers' purchases by asking, pointing, putting a product in the basket or grabbing it. A short period after the observation, mothers were administered a short questionnaire on children's television exposure in the home. Television exposure was measured by asking mothers to indicate which programmes their children watched on specific days (a programme was considered 'viewed' if the child watched 15 minutes or more of it) and an aggregate measure of weekly viewing was obtained from these data. Separate calculations were made for mean number of hours of commercial and non-commercial television watched per week.

Spearman rank correlation coefficients found a significant positive relationship between overall television reinforcement value and number of PIAs made ($r=0.64$, $p<0.01$), and between the commercial reinforcement ratio and number of PIAs made ($r=0.52$, $p<0.01$). In other words, the more effort a child exerted to keep the overall videotape playing, and the more effort they exerted to watch the commercials compared to the programme, the more PIAs they made per minute in the supermarket. Age was correlated positively with the commercial reinforcement ratio ($r=0.28$, $p<0.05$) and the overall television reinforcement value ($r=0.45$, $p<0.01$), although this may have been a study artefact, in that older children may have been more adept at pressing the response button than younger children. Age was also correlated positively with total number of PIAs ($r=0.44$, $p<0.01$) and number of independent PIAs ($r=0.37$, $p<0.01$), with older children making more attempts than younger children. The number of PIAs made correlated positively and significantly with total number of hours of commercial television watched per week ($r=0.31$, $p<0.05$), but not with total number of hours of non-commercial television watched. There was no significant

correlation with age, suggesting that the relationship between commercial television exposure and PIAs was not a function of age.

Reeves & Atkin (1979) also observed children's behaviour while shopping, and ascertained their potential television advertising exposure in general and just prior to the shopping trip by interviewing both children and mothers in the store immediately after the observation period. Advertising exposure was measured by asking children how much television they had watched on that Saturday morning (half of the observations were conducted on Saturday afternoons), and how much Saturday morning television they generally watched. Viewing indices, compiled using broadcast programme lists for 'viewing prior to the trip' and 'viewing in general' were obtained. Frequency of watching six popular Saturday morning adverts was also measured by showing children stills from the adverts and asking whether they usually, sometimes or never watched them.

Children initiated 58% of the cereal and confectionery purchase interactions, and in 32% of the interactions the child demanded a particular product (as opposed to requesting it). Just under two fifths of interactions were initiated by the mother. Mothers agreed to 55% of children's requests and demands for cereal or confectionery products, refused 21%, diverted 11% with suggestions for an alternative product, and ignored the remainder. Conflict over the choice of product occurred in 14% of interactions. Children requested a mean number of 1.6 products, while the actual number of products purchased was a mean of 1.5, indicating that the same number of products were purchased as were requested. Thirty eight percent of children had watched Saturday morning television before coming to the store. There was no relationship between whether children reported watching of television and probability of making a request or demand for a product. However, there was a significant relationship between amount of Saturday morning viewing and frequency of requests and demands, with children who had watched more Saturday morning television before the trip making more demands or requests for products than children who had watched less Saturday morning television ($t=1.69$, $df=36$, $p<0.05$). Other television exposure measures showed no significant relationship with frequency of requests or demands while shopping, although there was a tendency for children with higher television exposure to initiate requests and demands more frequently. The majority (61%) of mothers described themselves as yielding to some of children's requests for cereals and confectionery, while 27% said they did not yield very often; 12% said they yielded 'most of the time'. Frequency of reported yielding to children's requests was significantly related to higher levels of children's Saturday morning television viewing as reported by mothers ($r=0.27$, $p<0.05$). Yielding to requests was also significantly related to having more lenient rules about eating sweets.

(iii) Household Purchase

Goldberg (1990) examined the degree to which children are affected by television advertising or its absence, by comparing the household purchase of cereals among English- and French-speaking children in Montreal. At the time of the study, English-speaking children in Quebec were exposed to and mostly watched American television, while French-speaking children were also potentially exposed to American television but tended to watch more Quebec television, which banned children's advertising in 1980; they were therefore less likely to be exposed to advertising for children's cereals. The effect measure was cereal brands reportedly present in the kitchen

cupboards of a sample of 9-12 year old children. The sample was drawn from two summer camps and two schools, one of each being middle income and one lower income. Amount of television viewing generally, amount of American television viewing, language and household income were all examined to enable the independent impact of exposure to American television to be estimated. In a multiple regression analysis, main effects for American television viewing were found, with children who had the highest level of American television viewing reporting more household purchase of children's cereals (mean = 2.67) than children with a low level of American television viewing (mean = 1.62). There was also a significant main effect for income ($F= 19.78$, $p<0.0001$), with low income children reporting more household purchase of children's cereals (mean = 2.42) than upper-middle income children (mean = 2.03). No significant main effect was found for language nor were any significant interactions found, although the interaction of level of American television viewing by income approached significance ($p<0.007$). Regression analysis indicated that exposure to American television increased household purchase of cereals independently of income or language, suggesting that the difference could not be solely attributable to cultural differences between high and low cereal purchasing households.

(iv) Reported Purchase Influence Behaviour

Two cross-sectional studies measured the relationship between children's food advertising exposure on one hand and their purchase influence behaviour, as reported in one case by mothers (Taras et al 1989) and in the other by children themselves (Atkin 1975b).

Atkin (1975b) measured exposure using a 'cereal advertising exposure index' and a 'candy advertising exposure index'. These were created by multiplying respondents' reported amount of Saturday morning television viewing by their reported frequency of paying attention to adverts for the two types of products. Correlation coefficients were calculated to describe the linear relationship between the advertising exposure measures and reported purchase-related behaviour (asking parents to buy advertised foods). Percentage differences were also calculated, comparing respondents who were 'heavily' and 'lightly' exposed to certain types of advertising. Advertising exposure scores were dichotomised near the median to classify respondents into heavy and light exposure groups. Cereal advertising exposure was moderately correlated with frequency of requesting cereal purchases (+.32). Twelve percent of respondents with 'light' cereal advertising exposure asked their mothers to buy cereals a lot compared with 27% of respondents with 'heavy' cereal advertising exposure (no significance values are quoted). The correlation remained moderate even when grade, sex, social status and school performance were controlled for (+0.27). Overall, the study indicated that children who reported watching more Saturday morning television more often asked for cereals. More than twice as many 'heavy viewers' of Saturday morning television as 'light viewers' reported making cereal purchase requests 'a lot' of the time.

Taras et al (1989) investigated the relationship between children's television viewing and their food purchase requests. Television viewing was measured using mothers' recall of the number of hours of television their children watched during and between meals on a typical weekday, Saturday and Sunday, and purchase requests were measured by asking mothers to list foods which they felt their children had asked them to buy in the past six months because of television's influence, including brand names if known, and to indicate which they had subsequently purchased. High sugar food

items made up 66% of foods requested, followed by high fat (36%), high salt (19%), and low sugar/fat/salt (7%) foods. Of the items which mothers reported buying in response to requests, high sugar items made up 58% of purchases, followed by high fat (34%), high salt (22%), and low sugar/fat/salt (11%) foods. Significant positive correlations were found between hours of television viewing and the number of food items which mothers perceived had been requested because of television's influence ($r=0.31$, $p=0.006$) and the number of food items subsequently purchased ($r=0.44$, $p=0.001$). Snacking while watching television was also significantly positively correlated with number of food items requested and purchased and with caloric intake.

Discussion

Methods

The studies covered the age range 3 years to secondary school, and were all conducted in the USA or Canada. Although some involved relatively small sample sizes (eg. Stoneman & Brody 1982) $n=36$, Galst & White (1976) $n=41$, others involved samples of several hundred (Goldberg (1990) $n=475$, Atkin (1975b) $n=775$, French et al (2001) n =vending machine users over a year in 12 secondary schools). The samples also achieved a reasonably representative range of income levels.

The three experiments (French et al 2001, Stoneman & Brody 1982, Galst & White 1976) were higher scoring (ie. good quality) studies which appeared to have been well-conducted and were methodologically robust. All three studies combined the strengths of experimental design with naturalistic measures of behaviour. The French et al (2001) study combined a rigorous experimental design, with tight control over the independent variables of interest (promotional signage and pricing), with a 'hard' measure of behaviour - actual sales over a twelve-month period. The study was also one of the few to examine promotion other than television advertising. The Stoneman & Brody (1982) study, although small in size, also combined the benefits of an experimental design with a naturalistic, albeit short-term, measure of effects – children's observed actual behaviour while shopping. Galst & White (1976) combined detailed data on children's attentiveness to television advertising and programmes in a laboratory with observation of their behaviour in a natural setting, while shopping. They also measured children's television exposure at home through parental recording of viewing of specific programmes. This was a particularly useful study as it attempted to differentiate between children's attentiveness to advertising and their attentiveness to television programmes, and to compare effects.

The quasi-experimental study, Goldberg (1990), was a higher scoring study utilising a complex design. Although the sample design (both schools and summer camps) was complicated, the sample size was large and appeared sufficiently representative of both middle and lower income populations. Overall, this was a strong study which took advantage of the natural experimental situation created by the Quebec ban on advertising to children to conduct a relatively rigorous examination of the effects of advertising. The regression analyses were stronger and more useful than the correlational analyses, and examined both main and interaction effects when controlling for other potential important factors (family income and language). The use of children's self-reported television watching as the main measure of exposure, and of children's recall of cereal products in the home as the main indicator of an imputed behavioural effect, were weaker elements of the study.

Recall may be unreliable, and there was no indication in the study that attempts were made to verify the accuracy of children's recall. Recall of products in the home was also a somewhat imprecise measure of impact on the child.

The observational study Reeves & Atkin (1979) was a medium scoring study in terms of quality. The sample was large for an observational study (n=100), and relatively detailed measures of television viewing, as a proxy measure for exposure to children's food advertising, were taken (Saturday morning viewing on a particular day, viewing of ten specific Saturday morning programmes, and general amount of Saturday morning viewing). This meant that the potential effect of exposure to television featuring a large number of children's food adverts, rather than television in general, could be assessed. The analyses conducted (chi-square tests, t-tests and correlations) were basic but appropriate to the relationships investigated in the study.

Of the two cross-sectional studies, Atkin (1975b) was medium scoring in terms of quality and Taras et al (1989) was lower scoring. As discussed in the Introduction to Q2, a potential weakness of cross-sectional studies is the use of television viewing as a proxy measure of exposure to food promotion. In this respect, Taras et al (1989) was particularly weak, relying on mothers' recall of how many hours of television children watched on typical weekdays, Saturdays and Sundays, then aggregating the data into a general television viewing variable, rather than analyzing any differences between heavy Saturday viewing and viewing at other times of the week. This meant that the potential effects of television viewing at times featuring a large number of children's food adverts could not be distinguished from effects of television viewing at other times. Atkin (1975b) generated a more precise measure by combining self-reported viewing of specific programmes with a measure of self-reported frequency of paying attention to adverts for specific products. Both calculated only correlation coefficients, rather than conducting regression analysis, to analyse the relationship between food promotion and purchase-related behaviour. Correlations simply show association with no account for cofounders. Causality cannot be assumed as there may well be confounding variables that account for variation in purchase-related behaviour. Atkin (1975b) calculated fourth order correlation coefficients enabling the effects of grade, gender, socio-economic status, and school performance to be controlled for. The studies would have been stronger had they used multiple regression analysis to examine the relationship between food promotion and other factors on purchase-related behaviour. While the multiple regression approach would still only have identified association rather than causation it would have enabled the effect of food promotion to have been assessed independently of several other potential influences on purchase-related behaviour.

Findings

All the studies addressing this question found a significant effect of food promotion on children's purchase-related behaviour, or a significant association, not necessarily causal, between the two. The study ratings suggest that more weight should be attached to the findings of the three better quality experimental studies (French et al 2001, Stoneman & Brody 1982, Galst & White 1976) and the natural experiment (Goldberg 1990).

French et al (2001) found that vending machine promotion significantly increased sales of low fat snacks in secondary schools independently of pricing variables. Although the study was concerned

specifically with sales of low fat products and did not examine the effect of promotion on sales of other products (eg. high or 'normal' fat snacks), it did provide robust evidence of a causal link between promotion and purchasing, and was one of the few studies to provide hard data on actual sales to children.

Goldberg (1990) provided evidence that exposure to advertising was able to explain differences in household purchase behaviour between children of similar income and cultural backgrounds. The study found significant associations between, on the one hand, heavier exposure to American television and greater household purchase of advertised cereals, and on the other hand between heavier exposure to Quebec television (which disallowed children's advertising) and lower household purchase of advertised cereals. On average, the group of children with higher levels of exposure to American television appeared to purchase one more advertised cereal than the group of children with lower levels of exposure when other influences were controlled for, a relatively important effect.

Two experimental studies found that exposure to food promotion increased children's purchase influence behaviour observed in a natural setting (supermarket shopping with parents) (Stoneman & Brody 1982, Galst & White 1976). Stoneman & Brody (1982) found that exposure to food promotion stimulated children to use 'pester power' more frequently, both in relation to products they had seen advertised and generally. Shopping with mothers was characterised by significantly increased strife and conflict for those children who viewed food commercials prior to shopping. Galst & White (1976) found a significant link between children's attentiveness to advertising and their subsequent behaviour in a supermarket: the more effort a child put into watching television commercials (defined as the frequency with which they pressed a button to maintain the pictures and sound on the screen), as compared with programmes, the greater the number of attempts to influence mothers' shopping purchases he or she made at the supermarket. The fact that only hours of commercial television watched per week (as opposed to hours of non-commercial television watched per week) correlated significantly with number of purchase attempts lent further support to the relationship between commercials and purchase influence behaviour.

The findings from these stronger studies were reinforced by the findings from the other studies, which come to similar conclusions. Reeves & Atkin (1979) found a modest correlation between the amount of Saturday morning television a child had watched before going shopping, and the frequency with which they requested or demanded products while shopping, while Atkin (1975b) found a modest correlation between children's potential exposure to cereal advertising on Saturday morning television and their self-reported frequency of asking their parents to buy cereals. In both studies, 'heavy viewers' of Saturday morning television made significantly more purchase requests than 'light viewers'. The cross-sectional study, Taras et al (1989) provided weak evidence of an association between television watching in general and food purchase requests to mothers.

Thus, overall, the weight of evidence suggests a strong influence of food promotion on children's food purchase and purchase-related behaviour. Both the stronger and weaker studies found evidence of effects. In all except one study, the effect was in the direction of increasing requests for foods high in fat, sugar or salt; in the one exception, the effect was in the direction of increasing sales of low fat snacks, although this was consistent with the food promotion examined in the study (low fat promotional signage and labelling), and therefore does not contradict the trend.

Q2: (4) Does food promotion influence children's food consumption behaviour?

Studies Under Review

Eleven studies investigated the effects of exposure to food promotion on children's food consumption behaviour. Consumption behaviour was defined in the review as encompassing three types of behaviour: one-off consumption (such as the amount of food eaten on one occasion during an experiment), short-term consumption (such as selection of snack foods for consumption over a period of one to two weeks during an experiment), and self-reported regular patterns of consumption behaviour (such as reported frequency of eating sweets). Studies which measured overall dietary intake were examined in Question 2:5, 'Does food promotion influence children's diet?'. Eight used randomized experimental designs and three were cross-sectional (Bolton 1983, Atkin 1975b, Ritchey & Olson 1983).

Respondents in the studies were all North American, and were pre-schoolers and their parents (Ritchey & Olson 1983), 2-11 year olds (Bolton 1983), 3-6 year olds (Galst 1980), 3-9 year olds (Cantor 1981), 4-5 year olds (Jeffrey et al 1982 Study 1), 4-5 and 9-10 year olds (Jeffrey et al 1982 Study 2/Fox 1981), 4th – 7th graders (Atkin 1975b), 5-6 year olds (Dawson et al 1988, Peterson et al 1984), 5-8 year olds (Gorn & Goldberg 1982/Gorn & Goldberg 1980b), and 8-10 year old Canadian boys (Gorn & Goldberg 1980a).

The eight experimental studies all used a similar design, involving exposing one or more randomly allocated experimental groups to exposure to one or more food promotion stimuli, and comparing their subsequent food consumption behaviour to that of a control group not exposed to the food promotion stimuli. Three studies measured short-term behaviour: daily selection of a snack or dessert for consumption during a school or summer camp break (Cantor 1981, Galst 1980, Gorn & Goldberg 1982/Gorn & Goldberg 1980b). The snack/dessert food selection studies were essentially measuring preferences over time - whether children were more likely to select 'healthier' or 'less healthy' foods in different categories after exposure to food promotion. They differed from the studies reported in Question 2:2 in that children selected actual foods for consumption, rather than simply indicating their preferences from picture boards. Five studies measured 'one-off' food consumption behaviour, by either observing respondents in an experimental facility (Dawson et al 1988, Peterson et al 1984), or by weighing food before and after children had been instructed to sample from it (Peterson et al 1984, Jeffrey et al 1982 Study 1, Jeffrey et al Study 2/Fox 1981, Gorn & Goldberg 1980a). Four of these five studies also compared differences between product categories (ie. did subjects consume different amounts of calories from 'healthier' and 'less healthy' foods?). Dawson et al (1988) measured whether children 'transgressed' instructions not to eat various experimental foods, and whether they transgressed more in relation to 'low' as opposed to 'high' nutrition foods. The two Jeffrey et al (1982 Study 1, 1982 Study 2/Fox 1981) studies measured whether children consumed differential amounts of calories from a tray of 'healthier' and 'less healthy' foods after exposure to food promotion. Consumption measures for food and beverages were initially taken by weight and volume and later converted to calories. Peterson et al (1984) measured how much children consumed from a tray of 'low' and 'high' nutrition foods after

ten days of exposure to food promotion. The consumption measure was generated by weighing each food portion on completion of the test, and comparing it with the weight prior to the experiment.

The food promotion stimuli in the studies were adverts for ‘sugared foods’ (Galst 1980), Pepsi, Fritos and Hersheys chocolate (Jeffrey et al 1982 Study 2/Fox 1981), ice cream (Gorn & Goldberg 1980a), adverts for confectionery, fruit and pro-nutritional PSAs (Gorn & Goldberg 1982/Gorn & Goldberg 1980b), ‘low nutrition’ foods (M&Ms) and ‘pro-nutrition’ foods (seedless grapes) (Dawson et al 1988), and ‘pronutrition foods’ (Peterson et al 1984, Jeffrey et al 1982 Study 2/Fox 1981). In the Peterson et al (1984) study, the experimental stimulus was children’s television programmes with a healthy eating theme plus five minutes of commercials or PSAs promoting “healthy eating habits and foods high in nutritional value” (the adverts are not described in the study. Cantor (1981) measured whether public sector nutritional messages had differential effects depending on whether they were humorous or non-humorous and on whether they were modified by being succeeded by a pro-sugar advert or an unrelated advert (a toy ad).

The cross-sectional studies measured self-reported frequency of various consumption behaviours and correlated them with measures of potential exposure to food advertising. Bolton (1983) correlated self-reported frequency of snacking with exposure to television food advertising measured using a television viewing diary. Atkin (1975b) correlated exposure to cereal and confectionery advertising with self-reported consumption of heavily and lightly advertised cereals, confectionery and food in general. Ritchey & Olson (1983) correlated children’s amount of television watching (as reported by parents) with their frequency of consuming sweet foods (also as reported by parents).

Findings

The findings from these studies overall provide modest evidence of an effect of food promotion on consumption behaviour.

Two studies found that exposure to food promotion had an effect on children’s consumption behaviour (Gorn & Goldberg 1982/Gorn & Goldberg 1980b, Jeffrey et al 1982 Study 2/Fox 1981). Two studies found variations in consumption behaviour, according to exposure to food promotion, but the results were not statistically significant and, therefore, no effect could be concluded (Dawson et al 1988, Jeffrey et al 1982 Study 1).

Four studies produced results which were for various reasons inconclusive. In Galst (1980) and Peterson et al (1984), it was difficult to separate out the effects of food promotion from other elements of the experimental stimulus. Galst (1980) appeared to indicate that exposure to food promotion had a *positive* effect on consumption behaviour (ie. it reduced selection of sugared snacks), whereas Peterson et al (1984) found that exposure to food promotion had no effect, but food promotion was not measured and analysed separately from other exposure variables in the studies. Cantor (1981) and Gorn & Goldberg (1980a) found that exposure to food promotion under certain conditions had an effect on consumption behaviour but that under other conditions it

did not. In Cantor (1981) the effect was to *increase* consumption of sweet foods, and in Gorn & Goldberg (1980a) to *reduce* consumption of ice cream.

The cross-sectional studies all found significant associations between potential exposure to television food advertising and different kinds of consumption behaviour.

The findings are presented thematically according to the three broad types of measures taken in the studies: selection of food for daily consumption, actual consumption/one-off consumption, and self-reported consumption frequency.

(i) Selection of Food for Daily Consumption

Three studies measured the impact of exposure to food promotion on children's daily selection of a snack or dessert. Gorn & Goldberg (Gorn & Goldberg 1982/Gorn & Goldberg 1980b) investigated the effects of confectionery adverts vs. fruit adverts vs. dietary PSAs on 5-8 year old children's daily snack food selections over a two week period. They found a significant treatment effect on children's drinks choices ($F(3,280) = 4.18, p < 0.01$), with children exposed to the fruit adverts selecting the most orange juice and children exposed to the sweets adverts selected the least orange juice (45% vs. 25%, $p < 0.05$). There was also a significant treatment effect on children's food choices ($F(3,280) = 5.32, p < 0.001$), with children exposed to the sweets adverts picking significantly less fruit (25%) than children in the other three groups (fruit adverts 36%, PSAs 35%, control 33%).

Cantor (1981) measured whether public sector nutritional messages had differential effects, on the daily dessert selections of 3-9 year olds, depending on whether the messages were humorous or non-humorous and on whether they were followed by an advert for sugared food or an unrelated advert (a toy advert). The relevant finding for the review is the additional impact, if any, of the sugared food advert. Children's daily choice of lunchtime dessert, from either fruit or a sweet pudding/cake, was recorded for one week before the experiment and for one week after the experimental exposure. Children exposed to the serious PSA plus the toy advert (ie. not exposed to the sweet dessert ad) made significantly fewer sweet dessert choices, and significantly more fruit dessert choices, after the experiment compared with children exposed to the serious PSA plus the sugared food advert and children exposed to the humorous PSA and the toy advert ($p < 0.05$). There were no significant differences in dessert choices between the two groups exposed to the humorous PSA either with or without the sugared food advert. In other words, children exposed to the serious PSA and the sugared food advert made more sweet dessert choices than children exposed to the serious PSA without the food advert, but a similar trend was not found for the humorous PSA. There was no comparison group exposed only to the sugared food advert, which would have enabled the impact of the sugared food advert to be better measured.

Galst (1980) exposed 3-6 year old children to adverts for sugared foods or non-sugared foods, viewed either with or without 'pro-nutritional' comments by an adult, daily for two weeks and measured their subsequent snack food selections. Control group children exposed to no adverts requested significantly *more* sugared snacks than children in three of the experimental conditions: adverts for added sugar foods viewed without adult comments; adverts for added sugar foods

viewed with adult comments; and adverts for non-sugared foods, viewed with adult comments. Children who were exposed to the adverts for non-sugared foods viewed with adult comments, requested significantly *fewer* sugared snacks than children in three of the conditions: adverts for added sugar foods viewed without adult comments; adverts for added sugar foods viewed with adult comments; and adverts for non-sugared foods plus dietary PSAs, viewed without adult comments. The presence or absence of adult pro-nutritional comments appeared to have no impact on the effect of sugared food adverts. Overall, exposure to the sugared food adverts appeared to 'improve' children's snack selection compared to the control group's selections. However, the study design did not permit the separation of the different advertising and advice influences, so it is difficult to assess the effect of the advertising element in this study, and the results should therefore be treated as inconclusive.

(ii) Actual Consumption/One-off Consumption

Jeffrey et al (1982 Study 1) compared the effects of 'low nutrition' and 'pro nutrition' adverts on 4-5 year old children's calorific consumption from a tray of different foods and drinks. Children exposed to the 'low nutrition' adverts increased their total calorific consumption from foods ($t(1,15)=2.41$, $p<0.05$), drinks ($t(1,15)=2.67$, $p<0.05$) and foods and drinks combined ($t(1,15)=3.38$, $p<0.01$), while those exposed to 'pro-nutrition' adverts increased their total calorific consumption only for drinks ($t(1,14)=2.36$, $p<0.05$) and the control groups displayed no significant changes between baseline and post-test. However, while these analyses were suggestive of a possible influence from 'low nutrition' adverts on the children's food consumption, the absence of any significant between groups or interaction effects from the ANOVA meant that no effect could be concluded. A second similar study by Jeffrey et al (1982 Study 2/Fox 1981) compared 4-5 year olds and 9-10 year olds' calorific consumption after exposure to similar stimulus materials. Boys exposed to the low nutrition adverts were the only group to display a significant increase in consumption ($p<0.05$). There was no significant mediating effect of age on this finding, although the change x group x sex interaction on the low nutrition foods and beverages approached significance ($F(2,84) = 2.75$, $p = 0.07$).

Dawson et al (1988) observed kindergarten children's 'temptation to transgress' an instruction not to eat the experimental food after exposure to adverts for 'low' and 'high' nutrition foods. Children exposed to 'low nutrition' food stimulus displayed more transgressive consumption behaviours than children exposed to the 'pro nutrition' food stimulus (15.35 vs. mean score 10.50, $p<0.01$), regardless of the commercial shown. However, no effect on consummatory behaviours was found for exposure to the different types of adverts. A trend effect in temptation to transgress was found for advertising exposure, although this was only significant at the 10% level. Children exposed to the low nutrition adverts reported the greatest temptation to transgress the instruction not to eat the food, followed by children exposed to 'pro-nutrition' adverts, non-food adverts, and no adverts (mean scores 3.67, 3.23, 2.37, 1.79, trend effect $p<0.09$).

Peterson et al (1984) found that ten days of exposure to 'pro nutrition' food promotion (a combination of adverts, PSAs and nutritional programmes) had no impact on kindergarten children's consumption from a tray of low and high nutrition foods. Consumption was measured both before and after the ten days of experimental exposure. No significant treatment-by-trials interactions were

obtained on any of the analyses. There was a tendency for experimental group children to consume more of the 'pro-nutrition' foods at post-test than children in the control group, but the differences were not significant. In other words, the experimental stimuli did not have a significant impact on food consumption behaviour. However, it was not possible to separate out the effect of the food advertising from the programme and public sector messages.

Gorn & Goldberg (1980a) exposed experimental groups of children to either one, three or five repetitions of an advert for a specific ice cream, three or five different adverts for the same ice cream, or no adverts. Actual consumption behaviour was measured by giving children a tub of the advertised ice cream to eat while watching a subsequent 15-minute programme unrelated to the experimental material. At the end of the programme, the containers were weighed to assess how much each children had eaten. The children themselves were also weighed to enable this factor to be controlled for within the analysis. Increased exposure to the adverts did not increase consumption of the ice cream, and there was a tendency for those seeing increased numbers of repetitions to eat *fewer* ounces of ice cream, although this was only significant at the 10% level (control: $x = 6.69$; one commercial: $x = 6.64$; three repetitions: $x = 6.26$; five repetitions: $x = 5.93$; $F = 2.57$; $df = 3, 108$; $p < 0.10$). This was not the case for those who viewed increased numbers of different commercials, where there was no discernible relationship between quantity of ice cream consumed and number of different adverts. In other words, exposure to several repetitions of a single advert appeared to 'reduce' food consumption, but exposure to several different adverts appeared to have no impact on food consumption.

(iii) Self-reported Consumption Frequency

Bolton (1983) developed a structural equation model using data from a cross-sectional survey to investigate the influence of food promotion relative to other variables on children's diet. The model had two components, a structural submodel which described the theoretical relationship between constructs, and a measurement submodel which operationalised the constructs in terms of multiple indicators. Five hypotheses were tested. This study is reviewed in full under Q2: (5) and Q3 below. Of relevance to this review question, however, is the study's investigation of the relationship between television advertising and snacking behaviour. One of the five hypotheses posited that frequency of snacking would increase with children's food commercial exposure, and with parents' snacking, decrease with parental supervision of diet, and increase with child's missed meals. The equation also hypothesised a partial effect of age on snacking, although in an unspecified direction.

The analysis indicated that children's food commercial exposure had a significant effect on snacking frequency, although small (explaining only 2% of the variance). Overall, the analyses suggested that children's exposure to television food advertising significantly increased the number of snacks consumed. According to the structural equation model, an increase in food advertising exposure by an additional 25 minutes per week (12 hours total viewing per week) would have caused a child to consume one additional snack per week.

Atkin (1975b) measured exposure using a 'cereal advertising exposure index' and a 'candy advertising exposure index'. These were created by multiplying respondents' reported amount of Saturday morning television viewing by their reported frequency of paying attention to adverts for

each product type. Correlation coefficients were calculated to describe the linear relationship between the advertising exposure measures and the various knowledge, attitudinal and behavioural measures. Cereal advertising exposure correlated with reported consumption of eight heavily advertised cereal brands (+ .41). The correlation remained strong when grade, sex, socio economic status and school performance were controlled for (+ .37). There was also a correlation, albeit weaker, between cereal advertising exposure and consumption of five lightly advertised brands (+ .27). In families with no reported rules restricting snacking, the partial correlation between consumption of cereals and cereal advertising exposure was + .49. Multi-variate analysis using path analysis procedures found that cereal advertising exposure was linked to cereal consumption both directly (+ .30) and indirectly, through purchase requests to parents (+ .27) which were then correlated with consumption (+ .26). Those more exposed to advertising tended to ask more often, and those who asked more often tended to eat more cereal. The direct path from exposure to consumption was fairly strong, and asking for cereal was not a necessary condition for advertising impact on eating patterns. The two exogenous demographic variables in the model, grade and socio-economic status, were not significantly related to cereal eating.

Confectionery advertising exposure was correlated with consumption of three heavily advertised confectionery products (+ .29); this dropped slightly to + .25 when controlling for school grade, school performance, sex and socio-economic status. Correlations between confectionery advertising exposure and consumption of lightly advertised confectionery products were equally strong, suggesting that respondents who viewed more confectionery adverts on Saturday morning television tended to eat all kinds of confectionery more frequently than lighter viewers. A modest correlation (+ .10) was found between exposure and quantity of confectionery eaten per week. A total advertising exposure index was created from measures of prime-time, teen-oriented and Saturday morning viewing (this measure did not include reported amount of attention paid to advertising). This was correlated with more general measures of food consumption, including asking parents to visit fast food restaurants. A correlation of + .30 (dropping to + .28 when controlling for grade, sex, socio-economic status and school performance) was found between the total advertising exposure index and consumption of five frequently advertised foods (crisps, soda, hamburgers, chocolate drinks and cookies). Identical correlations were found for consumption of less advertised foods (pretzels, hot dogs, ice cream, cake). The relationship between advertising exposure and consumption was stronger for girls than boys (+ .33 vs. + .20) and for children with parental snacking restrictions than for those without (+ .31 vs. + .24). Exposure was modestly correlated with frequency of asking to visit fast food restaurants (+ .17).

Overall, the study indicated that children who reported watching more Saturday morning television more often asked for cereals, expressed anger when requests were denied, and ate cereals. Exposure had a direct effect on amount of consumption as well as an indirect effect mediated by requesting cereal products. The strength of the direct effect may explain why number of purchase requests to parents was not found to be a stronger mediating variable.

Ritchey & Olson (1983) correlated pre-school children's amount of television watching (as reported by parents) with their frequency of consuming sweet foods (also as reported by parents). Foods were classified as sweet if they met one of three criteria: containing 10% or more proportion of sucrose, containing sucrose and adhesive or retentive to the teeth, or contributing calories in the form of sucrose but few essential nutrients. Ttests and analysis of variance revealed few consistent

relationships between family characteristics and parental and child attitudes and behaviours. Amount of television watched was related to the greatest number of other variables (the data are not presented in the article), and was therefore entered into multiple regression analyses. When children's frequency of consumption of sweet foods as reported by parents was the dependent variable, three independent variables had a significant relationship with consumption: parents' own frequency of consumption, amount of television watching, and parents' attitudes towards sweet foods. Together these variables accounted for 35% of the variance in children's frequency of consumption. Parents' frequency of consumption held the strongest association with child frequency of consumption ($p < 0.001$). Television watching made a significant contribution at the $p < 0.01$ level.

The analyses also examined whether the strength of the relationships between the variables changed depending on whether the pre-school child was the oldest in the family or not. Associations were found to be stronger when the pre-school child was the oldest in the family: parents' own frequency of consumption, amount of television watching, and parents' attitudes towards sweet foods together accounted for 54% of the variance in children's frequency of consumption when this child was the oldest, compared with only 12% when there were other older children in the family. Television watching made a significant contribution at the $p < 0.01$ level when the child was the oldest. When the child was the oldest, parents' frequency of consumption held the strongest association with child consumption ($p < 0.001$). Television watching and parental attitudes each made significant contributions at the $p < 0.01$ level. However, where there were other older children in the family, parental frequency of consumption was the only variable associated with child consumption, and explained 12% of the variance in consumption at $p < 0.05$ level.

Discussion

Methods

The studies covered the age range 2-11, and all the subjects were North American. Although some involved relatively small sample sizes (eg. Cantor (1981) $n=37$), others involved samples of several hundred (Atkin (1975b) $n=775$, Bolton (1983) $n=262$). Several study samples were predominantly middle class (Bolton 1983, Dawson et al 1988, Galst 1980, Gorn & Goldberg 1980a).

One of the experimental studies was higher scoring in terms of quality (Gorn & Goldberg 1982/Gorn & Goldberg 1980b) and the other seven were medium scoring (Cantor 1981, Dawson et al 1988, Galst 1980, Gorn & Goldberg 1980a, Jeffrey et al 1982 Study 1, Jeffrey et al 1982 Study 2/Fox 1981, Peterson et al 1984). All randomly allocated subjects to experimental conditions, and had the potential to relate immediate advertising exposure to a directly observable or otherwise measurable behavioural measure. In three of the studies, measures were taken over a one or two week period in a real-life setting (a school, nursery or camp), which perhaps reflects a more naturalistic measure of effect than one-off behaviour measured in an experimental laboratory.

Gorn & Goldberg (1982)/Gorn & Goldberg (1980b) was a well-designed and well-conducted study, and of direct relevance to the review. The study attempted to control for potential bias by 'blinding' summer camp workers to children's experimental group allocation, and to minimize response conformity by administering snack food selection on an individual basis.

Gorn & Goldberg (1980a) was a medium scoring study whose design permitted analysis of the potential effects of exposure to varying degrees of advert repetition and to varied sets of adverts for the same product. It examined the effect of one, three and five exposures to a particular advert as well as exposure to three different and five different adverts for the same product. A control group was studied to examine results in relation to no advertising exposure. The behavioural effect was measured by giving subjects the advertised product (ice cream) and allowing them to consume it during the study, and then by measuring the ounces consumed by each subject. The two Jeffrey et al (1982 Study 1, 1982 Study 2/Fox 1981) studies were also medium scoring, although there was some confusing sub-analysis of groups which did not take all factors into account, and not all of the relevant data were reported.

In two of the medium scoring studies, Cantor (1981) and Dawson et al (1988), the effects and relationships investigated were narrower in scope than some of the other effects and relationships measured, and therefore of lower relevance. Cantor (1981) used a somewhat limited measure of consumption (one selection on the one day a week that a child attended the centre scored the same as five selections per week for a child who attended every day) and the study experienced a high rate of attrition. The main focus of the study was on comparing humorous and non-humorous public sector nutritional messages, and on examining whether their effects were modified at all by the addition of sugared food advert which might have 'undermined' the message. One sort of PSA, the serious one, was modified by the addition of the sugared food advert, but the humorous PSA was not affected by the addition of the sugared food advert. Few conclusions of relevance to this review can be drawn from this study. In the Dawson et al (1988) study, the main focus was on children's potential transgression of instructions not to eat food, and the impact of television on this. The study's main focus can therefore be seen as whether advertising affect's children's honesty or compliance. Overall the study found little clear evidence of a relationship between type of food advertising exposure and 'transgression', and the results are of limited relevance to the review question.

In another two of the medium scoring studies, Galst (1980) and Peterson et al (1984), it was not possible to separate out the potential effects of the food advertising from other experimental stimuli examined at the same time: the absence or presence of adult nutritional advice in Galst (1980), and the presence of nutritional programming and PSAs in the Peterson et al (1984) study. In Peterson et al (1984) it was not possible to separate out the potential effects of the food advertising from other experimental stimuli examined at the same time (nutritional programming and PSAs). This limits the study's relevance, as it is difficult to draw conclusions about the effects of food promotion. Similarly, in Galst (1980) the study design did not permit the separation of the different advertising and advice influences, so it is difficult to assess the effect of the advertising element in this study, and the results should therefore be treated as inconclusive. Another difficulty with the study was that food selections were made in groups, rather than individually, so there may have been a peer influence effect on selections which was unrelated to the experimental variables.

The three cross-sectional studies were of varying quality. One study (Bolton 1983) was higher scoring, one (Atkin 1975b) was medium scoring, and one (Ritchey & Olson 1983) was lower scoring. As discussed in the Introduction to Q2, the use of a proxy measure of exposure to food advertising, television viewing, is problematic. However, the usefulness of 'frequency of television

viewing' as a measure of food promotion exposure can be strengthened in a number of ways. Television viewing at times of the week characterized by frequent child-oriented advertising, such as Saturday mornings and weekday afternoons, is a stronger measure of potential exposure to food promotion than is general television viewing. Another approach is to ask children which programmes they watch. This can serve as a general indicator of viewing at child-oriented times of the week, or can be combined with other data to obtain a more precise measure of potential exposure to food promotion. The three studies here used measures of varying precision. Bolton (1983) asked children to keep a viewing diary over a given period, then calculated from broadcast data which commercials were shown during those programmes, thereby generating a reasonably precise measure of what food advertising would have been potentially seen by each respondent. Atkin (1975b) combined self-reported viewing of specific programmes, including Saturday morning children's programmes, with a measure of self-reported frequency of paying attention to adverts for specific products. In this way the study generated a more precise measure than simple amount of television viewing, one that would reflect likely exposure and attention to food advertising aimed at children. In contrast, Ritchey & Olson (1983) did not describe the television viewing measure used in their study, so it was not possible to judge what level of potential exposure was measured.

Bolton (1983) was a complex, high quality study which found a small but significant association between television viewing and frequency of snacking. The structural equation model which attempted to estimate parameters was based on an underlying theory of causal interactions which allowed direct and indirect influences controlling for other factors, especially parental influences, and exogenous and endogenous (two way causality) responses. The quality of measures was reasonably strong for a cross-sectional study, as both the food consumption measures and television viewing measures were based on diaries of behaviour over a fairly long period of time (7 and 16 days respectively). The complex regression model allowed for endogeneity and simultaneous equation modelling.

Atkin (1975b) conducted less sophisticated analysis than did Bolton – the study calculated only correlation coefficients for the relationship between food promotion and consumption behaviour, rather than regression analyses. However, the calculation of fourth order correlation coefficients enabled the effects of grade, gender, socio-economic status, and school performance to be controlled for.

Ritchey & Olson (1983) was a lower scoring study. Limited information was provided on sample selection or response rate, and there were also difficulties with the analysis. The food frequency measures were each included as dependent variables within multiple regression analyses to examine the association between each of these and the independent variables: parental frequency of eating sweet foods, amount of television watched by child and parental attitudes towards giving sweet foods in positive contexts. This allowed the model to examine the influence of television exposure in relation to and controlling for parental behaviour and attitudes. However, the study also ran separate regression analyses for children who were the oldest child in the family and those who had older siblings. As the results differed for each group it was difficult to draw conclusions from the analyses and it may have been more appropriate to include this 'position within family' variable as a dependent variable in the regression analyses and thus control for its influence.

Findings

The studies provide modest evidence of an effect on consumption behaviour.

Two experimental studies found that exposure to food promotion had an effect on children's consumption behaviour: in one, it reduced their likelihood of selecting fruit or orange juice, compared to a sweet, for a daily snack (Gorn & Goldberg 1982/Gorn & Goldberg 1980b), and in one it increased boys' calorific consumption from a tray of snack foods (Jeffrey et al 1982 Study 2/Fox 1981). Three cross-sectional studies (Bolton 1983, Atkin 1975b, Ritchey & Olson 1983) found small but significant associations between exposure to television food advertising (as measured using television viewing) and frequency of snacking or consumption of specific foods, although the studies were of varying quality.

Two studies found variations in consumption behaviour, according to exposure to food promotion, but the results were not statistically significant and, therefore, no effect could be concluded (Dawson et al 1988, Jeffrey et al 1982 Study 1).

Four studies produced results which were for various reasons inconclusive: Galst (1980) appeared to indicate that exposure to food promotion had a *positive* effect on consumption behaviour (ie. it reduced children's selection of sugared snacks), whereas Peterson et al (1984) found that exposure to food promotion had no effect on children's consumption behaviour, but it was not possible in either study to disentangle the effects of food promotion from other experimental stimuli examined at the same time. Cantor (1981) and Gorn & Goldberg (1980a) found that exposure to food promotion under certain conditions had an effect on consumption behaviour but that under other conditions it did not: in Cantor (1981) the effect was to *increase* consumption of sweet foods, while in Gorn & Goldberg (1980a) the effect was to *reduce* consumption of ice cream.

Overall, the studies provide modest evidence of an effect of food promotion on consumption behaviour. Effects were sometimes inconsistent and were not found in all the studies, but were found in sufficient studies to suggest that food promotion can, in some contexts, influence children's food consumption.

Q2: (5) Does food promotion influence children's diet and health-related variables?

Studies Under Review

Six studies are examined in this section. Four investigated the relationship between television viewing and children's diet (Bolton 1983, Coon et al 2001, Gracey et al 1996, Taras et al 1989). For the purpose of this question, diet was defined as children's food and nutrient intake over a sustained period, rather than short-term consumption or self-reported frequency of consumption behaviour in relation to a small number of foods, as measured in the previous section. The other two studies examined health-related variables: one examined the relationship between television viewing and obesity (Dietz & Gortmaker 1985) and one (Wong et al 1992) examined the relationship

between television and video viewing and cholesterol levels. All were cross-sectional studies, and one also included a longitudinal element (Dietz & Gortmaker 1985).

Exposure to food promotion was measured in all six studies using proxy measures, of reported television viewing. The use of 'television viewing' as the exposure variable presents particular problems with causality in relation to this question (see Introduction to Q2, and also Discussion below). The specificity of the measure, and the extent to which it captured potential exposure to food promotion, varied across the studies. Bolton (1983) calculated average food commercial minutes viewed per week from cross-referring subjects' 16-day television diaries, in which they recorded every programme they watched over the study period, with television station broadcasting data. Gracey et al (1996) measured reported hours of viewing on weekdays and at weekends, while Dietz & Gortmaker (1985) calculated mean hours of television viewed daily for each respondent. In the Taras et al (1989) study, the measure was mothers' recall of the number of hours of television their children watched during and between meals on a typical weekday, Saturday and Sunday. Coon et al (2001) measured parents' self-reports of whether television was on during children's meals (breakfast, after-school snacks and supper). Wong et al (1992) measured parents' reports of hours children spent watching television and playing video games, and correlated these with cholesterol levels as measured during routine paediatric examinations. Three different levels of exposure were recorded and analysed (up to two hours per day, two-four hours per day, over four hours per day), but no attempt was made to record hours spent watching television separately from hours playing video games.

Subjects in the studies were 2-11 year olds from predominantly white, higher socioeconomic backgrounds (Bolton 1983), mothers of children aged 3-8 (Taras et al 1989), 4th-6th graders and their parents (Coon et al 2001), parents of children aged 2-20, mean age 7.4 (Wong et al 1992), 6-11 and 12-17 year olds interviewed as part of the US National Health Examination Survey (Dietz & Gortmaker 1985), and 15 year old Australian school students (Gracey et al 1996).

The studies took a range of dietary measures. Bolton (1983) asked subjects to keep a 7-day food diary, from which nutrient and calorific intake, nutrient efficiency and nutrient balance scores were calculated (the terms are explained in more detail below). Gracey et al (1996) took a simpler measure of food intake from a 30-item food variety score, from which a 'fat score' was also derived. Subjects' body mass index was also measured. Taras et al (1989) calculated children's body mass index and their food frequency as reported by mothers using the Willett Semi-Quantitative Food Frequency Questionnaire. In Coon et al (2001), children's 24-hour dietary recall interviews were conducted with the aid of a printed poster for estimating portion size. Data from the recall interviews were used to construct outcome variables at the level of nutrients and food groups. Scores were entered into the Minnesota Nutrient Data Base, described as a "standard programme for translating food consumption over three days into average daily consumption of nutrients". Food group variables were constructed for 15 different food groups, then 8 of the 15 groups were further aggregated into three food groups reflecting major nutrient content: fruit, veg and juice (nutrient dense foods), meat, poultry and eggs (major protein sources), and pizza, salty snacks and soda (low nutrient commonly consumed foods). Average intake of each of the food groups was measured both as frequency per day and as the percentage of daily total energy deriving from that food group. Dietz & Gortmaker (1985) measured obesity using triceps skinfold measurement. In Wong et al (1992), cholesterol levels were measured using a single finger-stick blood sample.

Findings

The four dietary studies all found some significant associations between television viewing and dietary intake. The other two studies found significant relationships between television viewing and obesity, and between television viewing/video game playing and high cholesterol. The findings are reported below according to the measures of effect taken – dietary intake, and obesity and cholesterol.

(i) Dietary Intake

Bolton (1983) constructed a complex structural equation model using data from a cross-sectional survey to investigate the influence of food promotion relative to other variables on 2-11 year old children's diet. The model had two components, a structural submodel which described the theoretical relationship between constructs, and a measurement submodel which operationalised the constructs in terms of multiple indicators. Five hypotheses were tested. The first hypothesised that children's food commercial exposure increases with parental food commercial exposure and decreases with parental supervision of television viewing. Children's food commercial exposure was hypothesised to affect their diet firstly by increasing snacking, and secondly by directly increasing calorific intake. Further, the authors posited that this intake would be proportionately larger than any increase in nutrient intake, because heavily advertised foods contribute proportionally more towards calorific than nutrient requirements. Food commercial exposure should also decrease nutrient efficiency (because a more efficient diet has more nutrients in proportion to calories than a less efficient diet), although the effects on nutrient balance would be unclear.

The rationale for the impact on diet was based on the theoretical assumption that exposure to food commercials could influence children's diet in two ways. Firstly, consumption of heavily advertised product classes could increase, while the amounts of product classes currently in the children's diets would not proportionally decrease or be otherwise altered. Increased product class consumption would be expected to produce an increase in nutrient and calorific intake, with the calorific intake increase being proportionally greater than the nutrient intake increase. Secondly, heavily advertised product classes could be substituted for some of the products currently in the child's diets. In this instance, it would be expected that the advertised product would contribute more to calorific intake and less to nutrient intake than the product it replaced – ie. calorific intake would increase and nutrient intake would decrease. If both types of change occurred, there would be expected to be an increase in calorific intake but the effect on nutrient intake would be uncertain. The second hypothesis posited that frequency of snacking would increase with children's food commercial exposure, and with parents' snacking, decrease with parental supervision of diet, and increase with child's missed meals. The equation also hypothesised a partial effect of age on snacking, although in an unspecified direction.

The third hypothesis stated that the child's calorific intake would increase with parents' calorific intake and decrease with parental supervision of diet, while the fourth hypothesised that child's nutrient efficiency would increase with parents' nutrient efficiency and increase with parental supervision of diet. These hypotheses reflected the assumption that the parents' objective was nutrient efficiency when an alteration in diet was considered. Hypothesis 3 also stated that child's

calorific intake would increase with snacking and decrease with missed meals, and hypothesis 4 that child nutrient efficiency would decrease with both snacking and missed meals. Age was hypothesised to affect both calorific intake and nutrient efficiency, but in an unspecified direction. Equation five hypothesised that child nutrient balance would increase with parents' nutrient balance, increase with parental supervision of diet, and decrease with snacking.

The analysis indicated that (in hypothesis two) children's food commercial exposure had a significant effect on snacking frequency, although small (explaining only 2% of the variance). It did not have a significant direct effect on children's calorific intake (in hypotheses three and four), but did significantly decrease children's nutrient efficiency, although again explaining only 2% of the variance. Overall, the analyses suggested that children's exposure to television food advertising influenced their diet in three separate ways. Firstly, it significantly increased the number of snacks consumed. According to the structural equation model, an increase in food advertising exposure by an additional 25 minutes per week (12 hours total viewing per week) would have caused a child to consume one additional snack per week. Secondly, this additional snack would have increased the child's calorific intake by approximately 1.4 % and decreased the child's nutrient efficiency by a similar amount, assuming that children typically snack on low nutrient, high calorie foods. Thirdly, children's exposure to television food advertising significantly decreased their nutrient efficiency directly, in addition to the indirect effect through increased snacking frequency. According to the model, an increase in food advertising exposure by an additional 25 minutes per week would have decreased the child's nutrient efficiency by about 6%. Because in this equation calorific intake was not affected, this implied that the child consumed low nutrient, high calorie foods in place of foods with equivalent calories but higher levels of nutrients. This was consistent with the notion that children's snack preferences are influenced by the low nutrient, high calorie foods advertised on television.

Coon et al (2001) conducted multiple linear regression analyses to test the relationships between television during meals and consumption of food groups and nutrients. The model controlled for child's age, sex and race, mother's education and employment status, household composition and income, parents' nutritional knowledge attitudes and norms, and frequency of parents preparing quick suppers per week. Pearson's 2-tailed tests of bivariate association were examined for television during meals and the food group and nutrient measures. Seven of the 15 food groups, all three combined food groups and four of the selected nutrients exhibited significant bivariate associations with television during meals ($p \leq 0.05$) and were used as dependent variables in multiple linear regression analyses.

The study found that televisions were more likely to be on during meals in households with lower incomes ($p \leq 0.01$), single parents ($p \leq 0.05$) or less educated mothers ($p \leq 0.05$). Television presence during meals was inversely related to parents' nutritional knowledge, attitudes and norms ($p \leq 0.05$) and positively related to parents' attachment to meat ($p \leq 0.01$), and frequency of parents preparing quick suppers ($p \leq 0.01$). There was a relationship between the television being on during two or more meals per day and lower consumption by children of foods in the fruit and vegetable group (fruit, vegetables, juice and juice drinks) ($p \leq 0.01$). Consumption of foods in the meat group (red meat, processed meat, chicken, egg and fish) and foods in the pizza/salty snacks/soda group was significantly higher among children exposed to television during two or more meals per day ($p \leq 0.05$ and $p \leq 0.01$ respectively). Children in this group derived 6% more (compared with children

exposed to less television during meals) of their daily total energy from all three meat groups combined ($p \leq 0.01$), 5% more from pizza, salty snacks and sodas ($p \leq 0.01$), and nearly 5% less from fruits, vegetables and juices combined ($p \leq 0.001$). They also consumed more caffeine than children with low television exposure ($p \leq 0.01$).

Multiple linear regressions examined the relationship between each of five dependent variables (children's consumption of five food groups: fruit, veg, red meat, pizza and snacks, soda) and the independent variable presence of television during meals, controlling for socioeconomic factors, parents' nutritional knowledge, attitudes and norms and parents' use of quick foods. There was a significant relationship between more exposure to television and higher consumption of red meat ($p \leq 0.01$), pizza and snacks ($p \leq 0.05$) and soda ($p \leq 0.05$), and lower consumption of veg ($p < 0.01$). Of the socioeconomic and demographic variables, only two were significant: family income was significantly inversely related only to fruit consumption ($p \leq 0.05$), and being black was negatively associated with soda consumption ($p \leq 0.05$). Multiple regression also showed television during meals to be independently and significantly associated with percentage total daily energy from the three combined food groups. Compared to children with lower exposure to television during meals, higher exposure children derived a lower percentage of total daily energy from fruit, veg and juice ($p \leq 0.001$) and a higher percentage from meat ($p \leq 0.05$) and from pizza, snacks and soda ($p \leq 0.001$). Of the socioeconomic and demographic variables, being black was significantly associated with higher percentage of total daily energy from fruit, veg and juice ($p \leq 0.01$), from meat ($p \leq 0.01$), and lower percentage from pizza, snacks and soda ($p < 0.05$).

Gracey et al (1996) found that hours of television viewing per week, measured using a single item on a questionnaire, did not correlate significantly with body mass index, fat score or food variety score in 15-16 year old children. However, it seems that weekend television viewing was significantly correlated with Kinlay's fat score, although no details are reported. They conducted linear regression analyses with Kinlay's fat score and the food variety score as dependent variables. In each model, independent variables comprised variables that showed significant univariate relationships with these variables. Weekend television viewing was one of the independent variables in the Kinlay's fat score model, but appears not to have been included in the model of food variety score. This suggests that weekend television viewing had a significant univariate relationship with Kinlay's fat score but not with the food variety score. However, no details are given of the strength or significance of the univariate relationships. The regression models controlled for gender, age and school and all independent variables appear to have been entered in one step. The linear regression with Kinlay's fat score as the dependent variable showed that, controlling for age, fat score was positively associated with being male ($p < 0.001$), drinking alcohol ($p < 0.05$) and weekend television viewing ($p = 0.0513$) and was negatively associated with age ($p < 0.05$), self-efficacy ($p < 0.001$) and influence over food bought at home ($p < 0.05$). Thus, a higher level of weekend television viewing was associated with a higher fat score, although this just approached significance. The regression model explained 22% of variation in the fat scores. Overall, the study provided some evidence that weekend television viewing, independently of the other variables, impacted on the fat score.

Taras et al (1989) investigated the relationship between 3-8 year old children's television viewing habits, food purchase requests and diet. Significant positive correlations were found between hours of television viewing and number of food items requested as influenced by television ($r = 0.31$, $p = 0.006$), number of food items subsequently purchased ($r = 0.44$, $p = 0.001$) and caloric intake as

measured by the Food Frequency questionnaire ($r=0.34$, $p=0.001$). Snacking while watching television was also significantly positively correlated with number of food items requested and purchased and with caloric intake. Watching television during a meal was significantly negatively correlated with caloric intake. Correlations were also examined between food requests and purchases influenced by television and nutrient intake as assessed by the Food Frequency questionnaire. Total food requests and purchases were significantly correlated with saturated fat and sugar consumption ($p=0.012$ and $p=0.001$ respectively), but not with salt intake. Requests for and purchase of high fat foods were significantly correlated with saturated fat intake ($p=0.012$), sugar intake ($p=0.001$) and salt intake ($p=0.004$). Requests for and purchases of high sugar foods were significantly correlated only with sugar intake ($p=0.03$), while requests for and purchases of high salt foods were not correlated with salt intake. Overall, the study found a number of significant correlation coefficients linking television-influenced food requests, caloric intake, television viewing hours, mealtime viewing and body mass index. However, as no regression analyses were conducted, the relationships found indicate only associations rather than potential causal links.

(ii) Obesity and Cholesterol

Dietz & Gortmaker (1985) analysed both cross-sectionally and longitudinally the relationship between time spent watching television and prevalence of obesity in children aged 6-11 and 12-17. Three types of analyses were conducted: (i) Cross-sectional analyses comparing the prevalence of obesity and superobesity at different levels of reported television viewing. X^2 tests, simple regression coefficients, and associated F tests were used to indicate the strength and statistical significance of the associations. (ii) Weighted multiple regression analyses were conducted incorporating multiple environmental, economic and family variables as controls. The significance of the adjusted coefficient estimates was examined using F tests. Obesity and superobesity at cycle 2 were controlled for in the analysis of the effects of television viewing on obesity and superobesity at cycle 3. This procedure controlled for a range of potential confounding variables, including the possibility that prior obesity was a determinant both of current obesity and time spent watching television. (iii) The longitudinal sample provided the opportunity to investigate the effects of a 3- to 4- year time lag between television viewing and subsequent obesity. Weighted stepwise regressions were used for these analyses.

Cross-sectional analysis of the sample of children aged 6-11 indicated a significant relationship between television watching and obesity: children who watched more television experienced significantly more obesity ($p<0.01$) and superobesity ($p<0.02$) than children who watched less television. There were no significant relationships between obesity and children's reported number of friends, ability to get on with friends, time spent with friends, time spent alone, listening to the radio, reading, or other leisure activities. Cross-sectional analysis of the sample of children aged 12-17 also indicated a significant relationship between television watching and obesity: children who watched more television were significantly more obese ($p<0.0001$) or superobese ($p<0.0001$) than children who watched less television. There was a dose-response relationship between obesity, superobesity and time spent watching television. Estimated regression coefficients indicated that the prevalence of obesity increased by 1.2 to 2.9% for each additional hour of television watched per day. Similarly, the prevalence of superobesity increased by 1.4 to 1.6% for each additional hour of

television watched per day. It is not clear from the study whether these particular regressions controlled for any other variables, but they do not appear to have done so.

When a range of control variables were entered into the analysis to control for their potential influence on obesity, superobesity and television viewing – including past history of obesity at cycle 2 and socio-economic characteristics of the family - the magnitude of the television-obesity relationship was not altered in the cross-sectional analyses. Controlling for past obesity and socioeconomic characteristics did reduce the influence of television viewing on obesity in the longitudinal analysis, but the relationship between television viewing and obesity and superobesity was still significant ($p < 0.001$ and $p < 0.05$ respectively). A more stringent test of the relationship between television viewing and obesity was obtained by examining the association between television viewing at baseline and presence of obesity 3-4 years later in the longitudinal sample. When baseline obesity and family socioeconomic characteristics were controlled for, coefficient estimates for baseline television viewing and subsequent obesity and superobesity were 0.008 ($p < 0.07$) and 0.006 ($p < 0.03$), ie. marginally significant.

Wong et al (1992) analysed the strength of a range of possible predictors for child cholesterol level, including hours spent watching television and playing video games. Chi-square and Student's t-test analyses compared children with a total cholesterol level of 200 milligrams per decilitre or higher with those with levels less than 200 mg/dl. Variables examined included reported family history of myocardial infarction at less than 55 years of age, hypercholesterolemia (high cholesterol level), mean body mass index, blood pressure, hours of television/video watched daily (up to two hours, two-four hours, over four hours), and frequency of dietary and exercise behaviours. Variables displaying at least a marginally significant relationship were entered into multiple logistic regression analyses.

Children with higher cholesterol levels were more likely to have a parent or grandparent with high cholesterol ($p = 0.02$), to consume lean meat ($p = 0.01$), to have fat trimmed from meat ($p = 0.02$) to have food cooked in vegetable oil ($p = 0.04$), and to watch two or more hours of television/video per day ($p = 0.001$). The use of television watching as a predictor variable together with family history predictors identified 85% of the children with higher cholesterol levels. Only 66% of this group would have been identified without the use of television watching as a predictor. Children who reported watching more than four hours of television daily were less likely to consume lean meat ($p = 0.006$) or engage in physical activity ($p = 0.02$). Multiple logistic regression analyses with high cholesterol in children as the dependent variable found that family history of high cholesterol, higher levels of television viewing and lean meat consumption were each independently associated with increased risk of high cholesterol. Children watching 2-4 hrs of television daily were approximately twice as likely (relative risk 2.2, $p < 0.01$), and those watching 4+ hours four times as likely (relative risk 4.8, $p < 0.01$), to have a high cholesterol level than children watching less than 2 hours daily. The relative risk for family history of high cholesterol was 1.6 ($p < 0.05$), and for lean meat consumption 2.5 ($p < 0.01$).

Discussion

Methods

The age range of subjects was 2-20. Five of the studies were North American and one was Australian. Dietz & Gortmaker (1985) had a very large sample of nearly 11,500 and Wong et al (1992), Gracey et al (1996) and Bolton (1983) also involved large samples (of 1081, 391 and 262 respectively). Bolton's (1983) sample was predominantly white and of higher socioeconomic status, whereas in Coon et al (2001), the sample was non-randomly selected and of above average educational level; the other samples appeared to reflect a range of socio-economic groups. Taken as a group, the studies were some of the more recently published studies examined in the review, although three were nonetheless from the 1980s, and Dietz & Gortmaker (1985) drew on data from the 1960s. In terms of quality, one of the studies was higher scoring (Bolton 1983), four were medium scoring (Gracey et al 1996, Dietz & Gortmaker 1985, Coon et al 2001, Wong et al 1992), and one was lower scoring (Taras et al 1989).

As discussed above, the six studies all used television viewing as a proxy measure of exposure to food promotion. This poses a number of questions regarding interpretation. If a relationship is found between greater amounts of television viewing and higher levels of obesity or cholesterol, this may be attributable to the impact of the advertising seen while watching television, the impact of other messages seen while watching television, such as programme content, or to the sedentary nature of the activity itself (Dietz & Gortmaker 1985). Alternatively, it is possible that a high level of television viewing acts as a marker for a complex set of attitudes and behaviours within the family which taken together lead to observed associations between television and children's food-related behaviour and diets (Coon et al 2001). In the case of Wong et al (1992) in particular, where the measure was hours spent watching television watching and playing video games combined, the explanation that the observed results were attributable to the sedentary nature of the behaviour, or some other variable related to family lifestyle, cannot be ruled out.

In five of the studies, the potential effects of food advertising could not be disentangled from the general effect of television viewing, as there was little or no attempt to compare the effects of viewing at times when children were more or less likely to be exposed to food advertising. Coon et al (2001) measured television viewing during three meal periods (breakfast, after-school snacks, and supper), periods when there may have been heavier advertising to children, although no attempt was made to measure this. Taras et al (1989) used mothers' recall of how many hours of television children watched on typical weekdays, Saturdays and Sundays, then aggregated the data into a general television viewing variable, rather than analyzing any differences between heavy Saturday viewing and viewing at other times of the week. Gracey et al (1996) used a similar measure (hours spent watching at weekdays and weekends). Dietz & Gortmaker (1985) measured average hours of television viewed daily rather than hours of television viewing at child-oriented periods. Wong et al (1992) provided limited information on how television watching was calculated from parents' reports of children's viewing habits, and the measure, as noted above, was particularly problematic as it also included hours spent playing video games. However, one study, Bolton 1983, asked children to keep a viewing diary over a given period, then calculated from broadcast data which commercials were shown during those programmes, thereby generating a reasonably precise measure of what food advertising would have been potentially seen by each respondent. The use of

detailed television viewing diaries enabled a calculation of the extent to which each subject was exposed specifically to food advertising rather than simply the amount of time the subject spent watching television in general.

The studies also varied in quality in other respects. Overall, Bolton was the strongest study. The structural equation model which attempted to estimate parameters was based on an underlying theory of causal interactions which allowed direct and indirect influences controlling for other factors, especially parental influences, and exogenous and endogenous (two way causality) responses. The quality of measures was reasonably strong for a cross-sectional study, as both the food consumption measures and television viewing measures were based on diaries of behaviour over a fairly long period of time (7 and 16 days respectively). The complex regression model allowed for endogeneity and simultaneous equation modelling.

Dietz & Gortmaker (1985) was a large study which analysed data from a national source of good quality, although all the data were from the 1960s. There is considerable difficulty in judging the quality of the statistical techniques as the full regression results are not reported. The regression results which are reported are not clearly described or presented.

Wong et al (1992) was conducted with a large sample (n=1081) of 2-20 year olds, drawn from young people attending for routine physical examinations with five paediatricians and seven paediatric nurses. It is difficult to judge the representativeness of the sample and therefore the generalisability of the results. The main analysis was appropriate and used multiple logistic regression with the binary dependent variable being existence or not of a high cholesterol level (200 milligrams per decilitre or higher). Television watching was included in the model as an independent variable, and its contribution could therefore be assessed independently of family history and dietary habits that were also in the model.

Coon et al (2001) and Gracey et al (1996), although medium scoring overall, had a number of limitations. Gracey and colleagues used a long questionnaire administered under teacher supervision but with only a one item question on television viewing. The validity of this variable could well be questionable compared to other diary recall types of questions. This study had a relatively large sample of more mixed children drawn from three schools and a co-educational college. The generalisability of the findings to all Australian children may be questioned. The regression analyses attempted to take into account potential confounders in the relationship between dietary measures and television exposure. The standardised regression coefficients for the independent variables examined (gender, age, self-efficacy, amount of influence over food bought at home, drinking alcohol and weekend television viewing) were not reported, which meant that it was not possible to assess the relative strength of each influence. In Coon et al (2001), while food consumption appears to have been measured in a high quality way, the television viewing measure was weak, being one of television viewing at mealtimes rather than a more specific measure of exposure to television advertising. The sample appears to have been unrepresentative of the general population in the study's geographical area.

Taras et al (1989), the lower scoring study, provided no information on how the sample of 66 mothers was selected. The measure of mother's perceptions of what foods they had been asked to buy because of television's influence was a rather weak measure of influence. Test-retests were low

for this item, although higher for the television viewing measure. The study calculated only correlation coefficients for the relationship between food promotion and purchase-related behaviour. Correlations simply show association with no account for cofounders. Causality cannot be assumed as there may well be confounding variables that account for variation in purchase-related behaviour. The study would have been stronger had multiple regression analysis been used to examine the relationship between food promotion and other factors on purchase-related behaviour. While the multiple regression approach would still only have identified association rather than causation, it would have enabled the effect of food promotion to have been assessed independently of several other potential influences on purchase-related behaviour.

Findings

All six studies provided evidence, of varying strength, of a significant relationship between television viewing and dietary intake, and between television viewing and obesity or cholesterol. More weight should be attached to the findings of Bolton (1983) as this was a methodologically stronger study.

Bolton (1983) found a direct association between food advertising exposure, as calculated from children's television viewing diaries, and children's snacking frequency and nutrient efficiency. In both cases, the effect was small - explaining only two per cent of the variance - but significant. According to the structural equation model, an increase in food advertising exposure of 25 minutes per week influenced children's diet in three ways: it increased the number of snacks consumed by an additional one snack per week, it increased calorific intake by around 1.4%, and it decreased nutrient efficiency by a similar amount.

The findings from this study were reinforced by findings from the other five studies. The Dietz & Gortmaker (1985) study was the only one to investigate longitudinally the relationship between television viewing and diet. The study indicated that television viewing was independently predictive, at marginally significant levels, of obesity ($p < 0.07$) and superobesity ($p < 0.03$) in three to four years time. This effect occurred independently of prior obesity and socioeconomic characteristics of the family.

Coon et al (2001) found a significant association between television being on during meals and children's diet. Multiple linear regression found a significant relationship between more exposure to television during meals and higher consumption of red meat, pizza and snacks and soda, and lower consumption of veg. It also found that children with higher exposure to television during meals derived a lower percentage of their total daily energy from fruit, veg and juice and a higher percentage from meat and from pizza, snacks and soda, compared with children with lower exposure to television during meals.

Wong et al (1992) found that time spent watching television and playing video games was a significant and independent predictor of raised cholesterol in children. The use of television watching and video game playing as a predictor variable together with family history predictors identified 85% of the children with higher cholesterol levels. Multiple logistic regression analyses with high cholesterol in children as the dependent variable found that family history of high cholesterol, higher levels of television viewing/video game playing and lean meat consumption were each independently

associated with increased risk of high cholesterol. Children watching 2-4 hrs of television/playing video games daily were approximately twice as likely, and those watching 4+ hours four times as likely, to have a high cholesterol level than children watching less than two hours daily. Gracey et al (1996) found a marginally significant relationship between television watching and fat intake, while Taras et al (1989) found significant but modest associations between television watching, parents' agreement to food purchase requests and fat and sugar consumption.

Overall, there was evidence, from both stronger and weaker studies, of small but significant associations between television viewing and diet (four studies), television viewing and obesity (one study) and television viewing and cholesterol (one study). In five of the studies, the potential effect of food advertising on this relationship could not be disentangled from the general effect of television viewing (although this does not rule out the possibility that food advertising contributed to the relationship). One study, however, Bolton (1983), attempted to measure the specific contribution of food advertising. The study found that the greater a child's food advertising exposure, the more frequent his or her snacking and the lower his or her nutrient efficiency.

Q2: (6) Other effects of food promotion

Finally, two studies took attitudinal measures which, although not directly relevant to the review, are of interest. One (Lewis & Hill 1998) investigated the effects of food promotion on the self-perceptions of overweight children. The other (Gorn & Goldberg 1982/Gorn & Goldberg 1980b), examined children's perceptions of whether significant adults (doctors and researchers) would want them to eat fruit or confectionery as snack foods, and their views on what snack foods should be provided for other children at a summer camp (other results from this study are reported earlier in the review). Both studies were medium scoring in terms of quality.

Self-perceptions

Lewis & Hill (1998) conducted a non-randomised experiment designed to examine the effect of food adverts on the self-perception of overweight children. Subjects were 103 children (51 girls, 52 boys) aged 9-10 in Year 5 from two state schools in the north of England. Children in each class were non-randomly divided into two groups of 12-15. Each group viewed both a tape of five food adverts (for breakfast cereal, three different types of confectionery, and sauce/savoury spread) and a tape of five non-food adverts. The order of tapes was non-randomly varied. Before and after each viewing, children completed a short questionnaire rating current emotional state and self-perceptions (current state rating). At the end of the study, children's height and weight were measured, and they completed three other measurements/questionnaires assessing self-perceptions and eating behaviour. A Body Mass Index (kg/m^2) was calculated for each child. Children falling in the top 10%, with a mean BMI above the 97th percentile by British age-standardised norms, were defined as the overweight group. Children falling in the quartile around the median were defined as the normal weight group.

Because respondents participated in both experimental conditions, a repeated measures design was used. Analysis of variance examined the effects of the tapes on self-perceptions. The between

subjects factor was weight (overweight vs. normal weight), and the within subjects factors were advert type (food vs. non food) and time (pre vs. post exposure to adverts). The group of overweight children had a significantly greater preference to be thinner than the 'normal weight' children ($p < 0.001$) and were significantly less satisfied with their physical appearance ($p < 0.01$). Of the 'current state' ratings, only one, 'feeling fat', was significantly related to children's weight, with overweight children feeling significantly more fat than normal weight children ($p < 0.001$).

Viewing the adverts had significant effects on mood, with children reporting feeling significantly less worried and less sad, and more liked by their friends, after exposure to the adverts ($p < 0.05$ for all three measures). There were no significant main effects by advert type, although there were significant interactions on two rating scales 'feeling healthy' and 'feeling like eating sweets'. There were three-way interactions between advert type, time and weight. Thus, overweight and normal weight children responded differently to the two advert types on their ratings of 'feeling healthy' (three-way interaction: $F(1,33) = 11.26$, $p < 0.01$) and desire to eat sweets (three-way interaction: $F(1,33) = 5.80$, $p < 0.05$). After viewing the food adverts, overweight children felt more healthy and felt less like eating sweets while comparison children felt less healthy and more like eating sweets. The opposite occurred after viewing the non-food adverts, with overweight children reporting that they felt less healthy and more like eating sweets, while normal weight children reported feeling more healthy and less desire to eat sweets.

Attitudes / Normative Expectations

Gorn & Goldberg (1982)/Gorn & Goldberg (1980b) found that exposure to either confectionery adverts, fruit adverts or dietary PSAs had no impact on children's expectations of what key adults (summer camp workers and doctors) would want them to eat, or on their own attitudes regarding what snacks should be provided for other children at a summer camp.

Q3. If food promotion is shown to have an effect on children's food knowledge, preferences and behaviour, what is the extent of this influence relative to other factors?

Studies Under Review

Eight studies investigated the relative influence of food promotion or television viewing on children's food behaviour, diet or health-related variables compared to one or more other influences, and were of sufficient methodological quality to be included in the review. Seven were cross-sectional (Norton et al 2000, Coon et al 2001, Bolton 1983, Gracey et al 1996, Dietz & Gortmaker 1985, Wong et al 1992, Ritchey & Olson 1983) and one was experimental (French et al 2001).

Subjects in the studies were 2-11 year old children from predominantly white higher income backgrounds (Bolton 1983), pre-schoolers and their parents (Ritchey & Olson 1983), parents of children aged 2-20, mean age 7.4 (Wong et al 1992), 4th-6th graders and their parents (Coon et al 2001), children aged 9-18 from white middle class backgrounds (Norton et al 2000), 6-11 and 12-17 year olds interviewed as part of the US National Health Examination Survey (Dietz & Gortmaker

1985), 15 year old Australian school students (Gracey et al 1996), and users of vending machines in 12 secondary schools in Minnesota (French et al 2001). All were North American apart from the subjects in Gracey et al (1996).

The food promotion measures in the studies were imputed minutes of exposure to food promotion derived from reported weekly television watching (Bolton 1983), reported hours of viewing on weekdays and at weekends (Gracey et al 1996), mean hours of television viewed daily for each respondent (Dietz & Gortmaker 1985), and hours spent watching television and playing video games (Wong et al 1992). Coon et al (2001) measured parents' self-reports of whether television was on during children's meals (breakfast, after-school snacks and supper). Ritchey & Olson (1983) used parents' reports of amount of television watching by children, but did not explain how this was measured. In Norton et al (2000), the measure was perceptions of the influence of food advertising on food preferences (Norton et al 2000), while French et al (2001) measured the impact on food sales of different types of labelling and signage on snack food vending machines (French et al 2001).

The food-related effects measured in the studies were: sales of snacks from vending machines (French et al 2001), food preferences (Norton et al 2000), and frequency of consuming sweet foods (Ritchey & Olson (1983). Gracey et al (1996) assessed food intake from a 30-item food variety score, from which a 'fat score' was derived, and also measured subjects' body mass index. Bolton (1983) measured children's nutrient and calorific intake, nutrient balance and nutrient efficiency. Coon et al (2001) used children's 24-hour dietary recall interviews to calculate dietary intake variables at the level of nutrients and food groups. Scores were entered into the Minnesota Nutrient Data Base, described as a "standard programme for translating food consumption over three days into average daily consumption of nutrients". Food group variables were constructed for 15 different food groups, then eight of the 15 groups were further aggregated into three food groups reflecting major nutrient content: fruit, veg and juice (nutrient dense foods), meat, poultry and eggs (major protein sources), and pizza, salty snacks and soda (low nutrient commonly consumed foods). Average intake of each of the food groups was measured both as frequency per day and as the percentage of daily total energy deriving from that food group. Dietz & Gortmaker (1985) measured obesity using triceps skinfold measurement, while Wong et al (1992) measured cholesterol level.

Studies compared food promotion with a heterogeneous range of other potential dietary influences. As described in the Systematic Review Methods section, studies examining any dietary influences were eligible for inclusion providing that food promotion was one of the dietary influences examined. The French et al (2001) experiment examined the independent impact of pricing strategies and promotion strategies on snack food sales. In the Bolton (1983) study, the influence of food promotion on children was compared with the influence of parental diet supervision, parental snacking frequency, parental nutrient intake, child's age, and child's missed meals. Ritchey & Olson (1983) compared the influence of television watching with parents' frequency of sweet consumption and parents' attitudes towards sweet consumption. Norton et al (2000) asked subjects to indicate how much of an influence seven different motivational factors ('healthfulness', parents serving the food, peers eating the food, accessibility, price, taste and television advertising) were on their food preferences, and correlated these with preferences (degree of liking for foods) measured in an actual eating test. Gracey et al (1996) compared the influence on diet of weekend television watching with

the influence of age, gender, self-efficacy, control over foods purchased at home, and drinking alcohol. Dietz & Gortmaker (1985) examined whether television viewing predicted future obesity independently of prior obesity, while Wong et al (1992) examined whether television viewing and video game playing significantly predicted high cholesterol in children independently of a family history of high cholesterol. Coon et al compared television viewing during meals with socioeconomic factors (including race, gender, family composition, mother's education, mother's employment status and household income), parents' nutritional knowledge, attitudes and norms and parents' use of quick foods.

Findings

All eight studies found that food promotion or television viewing had effects independently of at least one other factor. The study findings are reported below according to the main measures of effect taken: sales of snack food, consumption behaviour, dietary intake, and health-related variables (obesity and cholesterol).

(i) Sales

French et al's (2001) randomised experimental trial compared the effects of different pricing and promotion strategies on low fat snack sales from school and workplace vending machines. Price reductions were significantly associated with percentage of low fat snack sales ($F_{3,66} = 156.89$, $p < 0.001$). With no price reduction, 10.9% of total sales were for low-fat snacks. This increased by 9%, 39% and 93% with price reductions of 10%, 25% and 50% respectively ($p < 0.05$). The number of low fat snacks sold (as opposed to the percentage) did not differ significantly between the control and the 10% price reduction condition. There were significant increases in the absolute number of low fat snack sales in the 25% and 50% price reduction conditions, compared with the other two conditions ($p < 0.05$). The size of the increase in the number of low-fat snack sales in the 50% price reduction condition was larger at schools than workplaces. In other words, the 10% price reduction increased the percentage of snack sales which were for low fat products without increasing the absolute number of low fat snacks sold or the total sales volume, suggesting that customers may have been substituting a low fat snack for a regular snack. However, with a 25% and 50% reduction, the absolute number of low fat snacks sold increased, as did the total sales volume (in the 50% reduction condition). This suggests that customers increased the number of snacks they bought from the machine, and may have actually increased their overall calorific intake.

Promotion (labelling and signage) was significantly and independently (ie. independently of pricing) associated with increased low fat snack sales ($F_{2,44} = 3.48$, $p < 0.04$). The percentages of low-fat snacks sold in the no signage, labelling, and labelling plus signage conditions were 14.3%, 14.5% and 15.4% respectively. Only the labelling plus signage condition differed significantly from the no signage condition in post hoc means comparisons ($p < 0.05$). The total number of low fat snacks sold did not differ significantly by promotion condition, suggesting that the promotions did not increase the total number of low fat snack sales, only the percentage of snacks sold which were low fat. Overall, the study showed that lowering the price of low fat snacks had a strong effect on

vending machine sales, while increasing promotional labels and signage had a smaller, but still significant, effect.

(ii) Consumption Behaviour

Ritchey & Olson (1983) compared the influence of television watching on children's consumption of sweet foods with the influence of parents' own frequency of consumption of sweet foods and parents' attitudes towards sweet foods. The study correlated pre-school children's amount of television watching (as reported by parents) with their frequency of consuming sweet foods (also as reported by parents). Foods were classified as sweet if they met one of three criteria: containing 10% or more proportion of sucrose, containing sucrose and adhesive or retentive to the teeth, or contributing calories in the form of sucrose but few essential nutrients. T-tests and analysis of variance revealed few consistent relationships between family characteristics and parental and child attitudes and behaviours. Amount of television watched was related to the greatest number of other variables (the data are not presented in the article), and was therefore entered into multiple regression analyses. When children's frequency of consumption of sweet foods as reported by parents was the dependent variable, three independent variables had a significant relationship with consumption: parents' own frequency of consumption, amount of television watching, and parents' attitudes towards sweet foods. Together these variables accounted for 35% of the variance in children's frequency of consumption. Among these variables, parents' frequency of consumption held the strongest association with child frequency of consumption (standardized regression coefficient = 0.44, $p < 0.001$). Television watching was also associated with children's frequency of consumption, although to a lesser degree than parents' frequency of consumption (standardized regression coefficient = 0.25, $p < 0.01$ level).

These regression analyses were also performed separately to examine the relationship when the pre-school child was the oldest in the family compared with when the pre-school child was not the oldest in the family. When the pre-school child was the oldest in the family, parents' frequency of consumption ($p < 0.001$), television watching ($p < 0.01$) and parents' attitudes towards sweet foods ($p < 0.01$) made significant and independent contributions. Together these variables accounted for 54% of the variance in children's consumption of sweets. Parents' frequency of consumption again held the strongest association with child frequency of consumption (standardized regression coefficient = 0.52, $p < 0.001$). Television watching also made a significant independent contribution, although to a lesser degree than parents' frequency of consumption (standardized regression coefficient = 0.31, $p < 0.01$ level). Similarly, parents' attitudes towards sweet foods made a significant and independent contribution, (standardized regression coefficient = 0.30, $p < 0.01$). Where there were older children, television advertising was not found to be associated with frequency of consumption of sweets. Only one independent variable, parents' frequency of consumption, entered the regression equation and accounted for 12% of the variance in child frequency of consumption at the $p < 0.05$ level.

(iii) Dietary Intake

Bolton's (1983) structural equation model, using data from a cross-sectional survey of 2-11 year old children's diet and lifestyle behaviours, compared the relative strength of a range of different predictors on children's snacking frequency, calorific intake, nutrient efficiency and nutrient balance. 'Nutrient efficiency' reflected the proportionality of nutrient requirements satisfied to energy (calorific) requirements satisfied, and was calculated by dividing the average % RDA intake over all

nutrients by the average % RDA calorific intake. 'Nutrient balance' was measured as the extent to which a respondent deviated from the average % RDA with respect to individual nutrients.

Overall, the analysis suggested that the influence of parental behaviour (snacking frequency) was more strongly associated with children's frequency of consumption than was television advertising exposure, but that advertising was nonetheless significantly and independently predictive of children's snacking frequency, nutrient efficiency, and, indirectly, caloric intake. As Bolton points out there is no analogue of the R^2 statistic for structural equation models. However, an OLS (Ordinary Least Squares) based procedure produced very similar results and allows the calculation of R^2 statistics. Using these OLS results, parental smoking frequency explained 29% of variance in children's snacking frequency, and child's age explained 4% of the variance (with older age being associated with less snacking). Parental diet supervision and child's missed meals were not significantly related to snacking frequency. Children's food commercial exposure had a significant effect on snacking frequency, although explaining only 2% of the variance. It must also be noted that considerable caution should be exercised in comparing percentages of variance explained in regression models and in drawing implications from difference in their sizes.

Children's food commercial exposure did not have a significant direct effect on children's calorific intake, but did significantly decrease children's nutrient efficiency, although explaining only 2% of the variance. Food commercial exposure also had significant indirect effects on children's calorific intake and nutrient efficiency, increasing the former and decreasing the latter. This indirect effect worked through the effects of food commercial exposure on children's snacking frequency, which in turn increases their calorific intake and decreases their nutrient efficiency. Again, these relationships are weaker, with children's food commercial exposure indirectly explaining approximately 1% of the variance in calorific intake and approximately 1% of the variance in nutrient efficiency. Children's food commercial exposure was not significantly associated with nutrient balance; parental nutrient balance explained approximately 9% of the variance in children's nutrient balance, whereas parental diet supervision, children's food commercial exposure and children's snacking did not have any significant effects.

Gracey et al (1996) compared the relative influence of different demographic and other factors on 15-16 year old children's fat intake and food variety. Linear regression with Kinlay's fat score as the dependent variable showed that, controlling for age, fat score was positively associated with being male ($p < 0.001$), drinking alcohol ($p < 0.05$) and weekend television viewing ($p = 0.0513$) and was negatively associated with age ($p < 0.05$), self-efficacy ($p < 0.001$) and influence over food bought at home ($p < 0.05$). Thus, a higher level of weekend television viewing was independently associated with a higher fat score, although this just approached significance. The regression model explained 22% of variation in the fat scores. Overall, the study provided some evidence that weekend television viewing, independently of the other variables, impacted on the fat score.

Coon et al (2001) examined the influence, on children's consumption of specific food groups and nutrients, of television being on during meals together with the influence of child's age, sex and race, mother's education and employment status, household composition and income, parents' nutritional knowledge attitudes and norms, and frequency of parents preparing quick suppers per week. Pearson's 2-tailed tests of bivariate association were examined for television during meals and the food group and nutrient measures. Seven of 15 food groups, three combined food groups (fruit,

vegetables, juice and juice drinks; meat; pizza, snacks and soda) and four nutrients exhibited significant bivariate associations with television during meals ($p \leq 0.05$) and were used as dependent variables in multiple linear regression analyses.

Televisions were more likely to be on during meals in households with lower incomes ($p \leq 0.01$), single parents ($p \leq 0.05$) or less educated mothers ($p \leq 0.05$). Television presence during meals was inversely related to parents' nutritional knowledge, attitudes and norms ($p \leq 0.05$) and positively related to parents' attachment to meat ($p \leq 0.01$), and frequency of parents preparing quick suppers ($p \leq 0.01$). There was a relationship between the television being on during two or more meals per day and lower consumption by children of foods in the fruit and vegetable group (fruit, vegetables, juice and juice drinks) ($p \leq 0.01$). Consumption of foods in the meat group (red meat, processed meat, chicken, egg and fish) and foods in the pizza/salty snacks/soda group was significantly higher among children exposed to television during two or more meals per day ($p \leq 0.05$ and $p \leq 0.01$ respectively). Children in this group derived 6% more (compared with children exposed to less or no television during meals) of their daily total energy from all three meat groups combined ($p \leq 0.01$), 5% more from pizza, salty snacks and sodas ($p \leq 0.01$), and nearly 5% less from fruits, vegetables and juices combined ($p \leq 0.001$). They also consumed more caffeine than children with low television exposure ($p \leq 0.01$).

Multiple linear regression examined the relationship between each of five dependent variables (children's consumption of five food groups: fruit; veg; red meat; pizza and snacks; soda) and the independent variable 'presence of television during meals', controlling for socioeconomic factors, parents' nutritional knowledge, attitudes and norms and parents' use of quick foods. There was a significant relationship between more exposure to television and higher consumption of red meat ($p \leq 0.01$), pizza and snacks ($p \leq 0.05$) and soda ($p \leq 0.05$), and lower consumption of veg ($p < 0.01$). Of the socioeconomic and demographic variables, only two were significant: family income was significantly inversely related only to fruit consumption ($p \leq 0.05$), and being black was negatively associated with soda consumption ($p \leq 0.05$). Multiple regression also showed television during meals to be independently and significantly associated with percentage total daily energy from the three combined food groups. Compared to children with lower exposure to television during meals, higher exposure children derived a lower percentage of total daily energy from fruit, veg and juice ($p \leq 0.001$) and a higher percentage from meat ($p \leq 0.05$) and from pizza, snacks and soda ($p \leq 0.001$). Of the socioeconomic and demographic variables, being black was significantly associated with higher percentage of total daily energy from fruit, veg and juice ($p \leq 0.01$) and from meat ($p \leq 0.01$), and lower percentage from pizza, snacks and soda ($p < 0.05$). The authors did not provide information about standardised regression coefficient estimates.

Overall, the study showed that higher exposure to television was associated with greater consumption of and higher percentage of total daily energy being derived from red meat, pizza and snacks, and soda. Higher television exposure was also associated with lower consumption of vegetables and lower percentage of total daily energy being derived from vegetables.

Norton et al (2000) found that food advertising was significantly related to liking for specific foods as measured in a food eating test, and that this association was independent of subjects' rated importance of the influence of other potential dietary influences such as peer eating habits, taste, accessibility, price, parents serving the food, and healthiness of the foods. When multiple regression

analyses were conducted on scores for each of these seven motivational factors, taste was significantly correlated with preferences for the highest number of foods (15 of the 17 foods). 'Healthfulness' was significantly related with preferences for four of the foods, as was accessibility (although not with the same four foods). 'Peers eat it' was significantly correlated with preferences for three of the foods. 'Parents serve it' was significantly correlated with preferences for one of the foods (broccoli), as was advertising (chicken). The subjects' views on the influence of price were not significantly correlated with preferences for any food. Stepwise regression, of the seven motivational factors on 17 food preferences, indicated that taste was most frequently found independently to influence food preferences, followed by advertising, peers eating, parents serving, accessibility and healthfulness. Price did not influence preference for any item. Taste was a significant influence on 16 food items, while advertising was a significant independent influence on three (apples, beans, low fat milk). 'Healthfulness' was an influence only on unsweetened cereals. Parents serving was an influence on cheese and whole fat milk, and peers eating was an influence on apples and chicken.

Television advertising ($p < 0.05$), taste ($p < 0.01$) and 'peers eat it' ($p < 0.05$) all significantly and independently influenced preferences for apples while the remaining motivational factors were controlled for. Similarly, television advertising ($p < 0.05$) and taste ($p < 0.01$) significantly and independently influenced preference for beans, and television advertising ($p < 0.01$) and taste ($p < 0.01$) significantly and independently influenced preference for low fat milk. These latter two regressions also controlled for the remaining motivational variables that were not found to be significant.

The cross-sectional design of all the studies in this section made it impossible to assess the extent of the influence of food promotion relative to other influences. The Bolton (1983) study did examine the strength of associations between different variables and children's dietary intake, and showed that associations between food promotion and children's dietary intake were weaker, or less certain, than some other variables, but this does not necessarily mean that the influence was less.

(iii) Obesity and Cholesterol

Dietz & Gortmaker (1985) analysed both cross-sectionally and longitudinally the relationship between time spent watching television and prevalence of obesity in children aged 6-11 and 12-17. Three types of analyses were conducted: (i) Cross-sectional analyses comparing the prevalence of obesity and superobesity at different levels of reported television viewing. X^2 tests, simple regression coefficients, and associated F tests were used to indicate the strength and statistical significance of the associations. (ii) Weighted multiple regression analyses were conducted incorporating multiple environmental, economic and family variables as controls. The significance of the adjusted coefficient estimates was examined using F tests. Obesity and superobesity at cycle 2 were controlled for in the analysis of the effects of television viewing on obesity and superobesity at cycle 3. This procedure controlled for a range of potential confounding variables, including the possibility that prior obesity was a determinant both of current obesity and time spent watching television. (iii) The longitudinal sample provided the opportunity to investigate the effects of a 3- to 4- year time lag between television viewing and subsequent obesity. Weighted stepwise regressions were used for these analyses.

Cross-sectional analysis of the sample of children aged 6-11 indicated a significant relationship between television watching and obesity: children who watched more television experienced significantly more obesity ($p<0.01$) and superobesity ($p<0.02$) than children who watched less television. There were no significant relationships between obesity and children's reported number of friends, ability to get on with friends, time spent with friends, time spent alone, listening to the radio, reading, or other leisure activities. Cross-sectional analysis of the sample of children aged 12-17 also indicated a significant relationship between television watching and obesity: children who watched more television were significantly more obese ($p<0.0001$) or superobese ($p<0.0001$) than children who watched less television. There was a dose-response relationship between obesity, superobesity and time spent watching television. Estimated regression coefficients indicated that the prevalence of obesity increased by 1.2 to 2.9% for each additional hour of television watched per day. Similarly, the prevalence of superobesity increased by 1.4 to 1.6% for each additional hour of television watched per day. It is not clear from the study whether or not these particular regressions controlled for any other variables, but they do not appear to have done so.

When a range of control variables were entered into the analysis to control for their potential influence on obesity, superobesity and television viewing – including past history of obesity at cycle 2 and socio-economic characteristics of the family - the magnitude of the television-obesity relationship was not altered in the cross-sectional analyses. Controlling for past obesity and socioeconomic characteristics did reduce the influence of television viewing on obesity in the longitudinal analysis, but the relationship between television viewing and obesity and superobesity was still significant ($p<0.001$ and $p<0.05$ respectively). A more stringent test of the relationship between television viewing and obesity was obtained by examining the association between television viewing at baseline and presence of obesity 3-4 years later in the longitudinal sample. When baseline obesity and family socioeconomic characteristics were controlled for, coefficient estimates for baseline television viewing and subsequent obesity and superobesity were 0.008 ($p<0.07$) and 0.006 ($p<0.03$), ie. marginally significant. While some controls were included in the regression analyses to account for the influence of past obesity and socioeconomic characteristics of the family, it is unclear from this study what influence these had relative to the influence of television viewing. However, the study does suggest that television viewing had a significant and independent impact on obesity and superobesity when socioeconomic characteristics of the family were controlled for.

Wong et al (1992) analysed the strength of a range of possible predictors for child cholesterol level, including hours spent watching television and playing video games. Chi-square and Student's t-test analyses compared children with a total cholesterol level of 200 milligrams per decilitre or higher with those children whose levels were less than 200 mg/dl. Variables examined included reported family history of myocardial infarction at less than 55 years of age, hypercholesterolemia (high cholesterol level), mean body mass index, blood pressure, hours of television/video watched daily (up to two hours, two-four hours, over four hours), and frequency of dietary and exercise behaviours. Variables displaying at least a marginally significant relationship were entered into multiple logistic regression analyses.

Children with higher cholesterol levels were more likely to have a parent or grandparent with high cholesterol ($p=0.02$), to consume lean meat ($p=0.01$), to have fat trimmed from meat ($p=0.02$) to

have food cooked in vegetable oil ($p=0.04$), and to watch two or more hours of television/video per day ($p=0.001$). The use of television watching as a predictor variable together with family history predictors identified 85% of the children with higher cholesterol levels. Only 66% of this group would have been identified without the use of television watching as a predictor. Children who reported watching more than four hours of television daily were less likely to consume lean meat ($p=0.006$) or engage in physical activity ($p=0.02$). Multiple logistic regression analyses with high cholesterol in children as the dependent variable found that family history of high cholesterol ($p<0.05$), higher levels of television viewing ($p<0.01$) and lean meat consumption ($p<0.01$) were each independently associated with increased risk of high cholesterol. The multiple logistic regression also controlled for family history of premature myocardial infarction and the practice of trimming fat off meat, but these were found not to be significant.

Children watching 2-4 hrs of television daily were approximately twice as likely (relative risk 2.2, $p<0.01$), and those watching 4+ hours four times as likely (relative risk 4.8, $p<0.01$), to have a high cholesterol level than children watching less than two hours daily. The relative risk for family history of high cholesterol was 1.6 ($p<0.05$), and for lean meat consumption 2.5 ($p<0.01$).

Discussion

Methods

The age range of subjects was 2-20. Seven of the studies were North American and one was Australian. Dietz & Gortmaker (1985) had a very large sample of nearly 11,500, and Wong et al (1992), Gracey et al (1996) and Bolton (1983) also involved relatively large samples (of 1081, 391 and 262 respectively). Bolton's (1983) sample was predominantly white and of higher socioeconomic status. Three of the studies were published since 2000, two in the 1990s, and three in the 1980s (although one of these, Dietz & Gortmaker 1985, drew on data from the 1960s).

Two of the studies were higher scoring in terms of quality (Bolton 1983, French et al 2001), while the remaining studies were medium scoring (Dietz & Gortmaker 1985, Gracey et al 1996, Wong et al 2001, Coon et al 2001) or lower scoring (Norton et al 2000, Ritchey & Olson 1983).

The one experimental study, French et al (2001), combined a rigorous experimental design, involving tight control over the independent variables of interest (promotional signage and pricing), with a 'hard' measure of behavioural effect - actual sales over a twelve-month period. This is the only study where it is possible to compare the extent of the influence of food promotion relative to another factor.

The seven cross-sectional studies varied in quality. Overall, Bolton, a higher scoring study, was the strongest. The structural equation model which attempted to estimate parameters was based on an underlying theory of causal interactions which allowed direct and indirect influences controlling for other factors, especially parental influences, and exogenous and endogenous (two way causality) responses. The quality of measures was reasonably strong for a cross-sectional study, as both the food consumption measures and television viewing measures were based on diaries of behaviour

over a fairly long period of time (7 and 16 days respectively). The complex regression model allowed for endogeneity and simultaneous equation modelling.

The cross-sectional studies all used television viewing as a proxy measure of exposure to food promotion. This poses a number of questions regarding interpretation. If a relationship is found between greater amounts of television viewing and higher levels of obesity or cholesterol, this may be attributable to the impact of the advertising seen while watching television, the impact of other messages seen while watching television, such as programme content, or to the sedentary nature of the activity itself (Dietz & Gortmaker 1985). Alternatively, it is possible that a high level of television viewing acts as a marker for a complex set of attitudes and behaviours within the family which taken together lead to observed associations between television and children's food-related behaviour and diets (Coon et al 2001). In the case of Wong et al (1992) in particular, where the measure was hours spent watching television watching and playing video games combined, the explanation that the observed results were attributable to sedentariness, or some other variable related to family attitudes and dynamics, cannot be ruled out.

In five of the studies, the potential effect of food advertising on diet or health could not be disentangled from the general effect of television viewing, as there was little or no attempt to compare the effects of viewing at times when children were more or less likely to be exposed to food advertising. Coon et al (2001) measured television viewing during three meal periods (breakfast, after-school snacks, and supper), periods when there may have been heavier advertising to children, although no attempt was made to measure this. Gracey et al (1996) used a similar measure (hours spent watching at weekdays and weekends). Dietz & Gortmaker (1985) measured average hours of television viewed daily rather than hours of television viewing at child-oriented periods. Ritchey & Olson (1983) did not describe the television viewing measure used in their study, so it was not possible to judge what level of potential exposure was measured. Wong et al (1992) provided limited information on how television watching was calculated from parents' reports of children's viewing habits, and the measure was particularly problematic as it also included hours spent playing video games. As such, the measure reflects sedentary behaviour at least as much as potential exposure to food advertising. However, one study (Bolton 1983) asked children to keep a viewing diary over a given period, then calculated from broadcast data which commercials were shown during those programmes, thereby generating a reasonably precise measure of what food advertising would have been potentially seen by each respondent. The use of detailed television viewing diaries enabled a calculation of the extent to which each subject was exposed specifically to food advertising rather than simply the amount of time the subject spent watching television in general.

Wong et al (1992) was a reasonable quality study, conducted with a large sample (n=1081) of 2-20 year olds. The sample was drawn from young people attending for routine physical examinations with five paediatricians and seven paediatric nurses. It is difficult to judge the representativeness of the sample and therefore the generalisability of the results. The main analysis was appropriate and used multiple logistic regression with the binary dependent variable being existence or not of a high cholesterol level (200 milligrams per decilitre or higher). Television watching was included in the model as an independent variable, and its contribution could therefore be assessed independently of family history and dietary habits that were also in the model.

Dietz & Gortmaker (1985) was a large study which analysed data from a national source of good quality, although all the data were from the 1960s. There is considerable difficulty in judging the quality of the statistical techniques as the full regression results are not reported. The regression results which are reported are not clearly described or presented.

Coon et al (2001) and Gracey et al (1996), although adequate overall, had a number of weaknesses. Gracey and colleagues used a long questionnaire administered under teacher supervision but with only a one item question on television viewing. The validity of this variable could well be questionable compared to other diary recall types of questions. This study had a relatively large sample of more mixed children drawn from three schools and a co-educational college. The generalisability of the findings to all Australian children may be questioned. The regression analyses attempted to take into account potential confounders in the relationship between dietary measures and television exposure. The standardised regression coefficients for the independent variables examined (gender, age, self-efficacy, amount of influence over food bought at home, drinking alcohol and weekend television viewing) were not reported, which meant that it was not possible to assess the relative strength of each influence. In Coon et al (2001), while food consumption appears to have been measured in a high quality way, the television viewing measure was weak, being one of television viewing at mealtimes rather than a more specific measure of exposure to television advertising. The sample appears to have been unrepresentative of the general population in the study's geographical area. As in Gracey et al (1996), the study did not report standardised regression coefficients for the independent variables examined (child's age, sex and race, mother's education and employment status, household composition and income, parents' nutritional knowledge attitudes and norms, and frequency of parents preparing quick suppers per week), which meant that it was not possible to assess the relative strength of each influence.

Ritchey & Olson (1983) was a weaker study. Limited information was provided on sample selection or response rate, and there were also difficulties with the analysis. The food frequency measures were each included as dependent variables within multiple regression analyses to examine the association between each of these and the independent variables: parental frequency of eating sweet foods, amount of television watched by child and parental attitudes towards giving sweet foods in positive contexts. This allowed the model to examine the influence of television exposure in relation to and controlling for parental behaviour and attitudes. However, the study also ran separate regression analyses for children who were the oldest child in the family and those who had older siblings. As the results differed for each group it was difficult to draw conclusions from the analyses and it may have been more appropriate to include this 'position within family' variable as a dependent variable in the regression analyses and thus control for its influence.

The Norton et al (2000) study was a particularly weak study as it relied on self-reported measures of the effects of food promotion (asking subjects how much of an influence they felt television had on their food preferences). The study found that television advertising was reported to be a significant influence only on degree of liking for four products which are generally not heavily advertised on television: chicken, apples, beans and low fat milk.

Findings

Overall, all eight studies provided evidence, of varying strength, that food promotion or television viewing exert an influence on children's food behaviour and diet independently of at least one other factor. However, not all the studies examined, or had data that could easily examine, the relative strength of the association or size of the influence of food promotion or television viewing compared with other influences. This, combined with the relatively small number of studies and the heterogeneous range of other dietary influence factors, means that it is not possible to draw definitive conclusions about the size of food promotion's influence on children relative to attitudinal, behavioural, familial, socio-economic and other factors. More weight should be attached to the findings of the two stronger studies (Bolton 1983, French et al 2001).

The one experimental study (French et al 2001) found that price appeared to have a stronger influence than promotional signage on sales of low fat snacks from vending machines in secondary schools. However, promotional signage significantly increased low fat snack sales independently of different pricing strategies.

One cross-sectional study (Bolton 1983) found that food advertising exposure had a significant impact on children's snacking frequency, nutrient efficiency, and, indirectly, calorific intake. The effect occurred independently of parental snacking frequency, child's age, parental diet supervision and child's missed meals. Food advertising exposure would seem to explain less of the variance in children's snacking frequency than parents' snacking frequency.

One study (Ritchey & Olson 1983) compared the influence of television watching on children's consumption of sweets with the influence of parents' frequency of consumption of sweet foods and parents' attitudes towards sweet foods. Television watching made a significant independent contribution to children's sweet consumption, although to a lesser degree than parents' frequency of consumption.

One study (Wong et al 1992) found that time spent watching television and playing video games was a significant and independent predictor of raised cholesterol in children.

One study (Dietz & Gortmaker 1985) indicated that television viewing was predictive, at marginally significant levels, of obesity and prior obesity in three to four years time, and that this effect occurred independently of prior obesity and family socioeconomic characteristics.

One study (Coon et al 2001) found that television being on during meals had a significant and independent influence on children's diet.

Norton et al (2000) found that television advertising was significantly associated with preferences for a small number of foods, and that this occurred independently of other motivational factors influencing food preferences. It was not possible, from the results presented, to judge the strength of influence of advertising relative to the other influences examined. The remaining study, Gracey et al (1996), provided weak evidence that television watching had a small, marginally significant, independent influence on fat intake.

Overall, then, there is evidence from both methodologically stronger and weaker studies that food promotion or television viewing significantly influences children's food behaviour and diet independently of other factors known to influence children's food behaviour and diet. However, there is little evidence to show whether the influence of food promotion on children's food behaviour and diet is greater or lesser than that of other factors. In the one study (French et al 2001) which compared the size of the effect (as opposed to the strength of the association) the effect was small relative to price.

Q4. In the studies which demonstrate an effect of food promotion on children's food knowledge, preferences and behaviour, does this affect total category sales, brand switching or both?

Studies Under Review

No studies addressed this question directly. Only one of the studies (French et al 2001) measured sales of any sort (low fat snacks from a vending machine), but it did not examine and compare brand and category effects. For a study to be able to answer this question directly, it would need to examine purchasing by children across both different brands within the same category and across different categories, and to be able to relate this purchasing to exposure to food promotion.

However, thirteen studies took measures which, while they cannot answer the question directly, help to shed light on it. These were studies which either examined the impact of food promotion on brand preferences or which examined the impact of food promotion on preferences and behaviour in relation to foods in different categories: for example, studies which measured whether food promotion caused children to prefer or consume foods in a higher fat, salt or sugar category compared with foods in a lower fat, salt or sugar category.

Five studies asked children to choose between different brands of the same product, one or more of which had been advertised on the experimental tape and one or more of which had not (Borzekowski & Robinson 2001, Clarke 1984, Heslop & Ryans 1980, Gorn & Florsheim 1985, Gorn & Goldberg 1980a). Two of these five studies (Gorn & Florsheim 1985, Gorn & Goldberg 1980a) also measured preferences between products in different categories: Gorn & Florsheim (1985) asked pre-adolescent girls to choose between a diet drink (featured in the experimental stimulus material), coffee, soft drink, milk and sugared drink, while Gorn & Goldberg (1980a) asked children to indicate their favourite food from a list containing the advertised product, ice cream and other snack foods.

Eight studies examined category, as opposed to brand, effects. Five of these eight studies asked children to pick, in a preferences test, between products in higher fat, salt or sugar and lower fat, salt or sugar categories (Goldberg et al 1978a & 1978b Study 1 & Study 2, Stoneman & Brody 1981, Kaufman & Sandman 1983, Peterson et al 1984). The other three studies asked children to select a daily snack or dessert from a choice between foods in higher sugar and lower sugar categories (Gorn & Goldberg 1982/Gorn & Goldberg 1980b, Cantor 1981, Galst 1980).

The thirteen studies all used a similar design, involving exposing one or more experimental groups to one or more food promotion stimuli, and all but one compared children's subsequent food preferences or attitudes to those of a control group exposed to different or no stimuli. The remaining study (Clarke 1984) had no control but involved eight different experimental groups in which the level of exposure to food promotion was varied, along with other characteristics of the viewing stimulus and context.

Subjects in the experimental studies were all North American, and were aged between 2 and 10 years: 2-6 year old children from low income backgrounds (Borzekowski & Robinson 2001), 3-6 year olds (Galst 1980), 3-9 year olds (Cantor 1981), 4 year olds (Clarke 1984), 4-8 year olds from middle and upper income backgrounds (Heslop & Ryans 1980), 5-6 year olds (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a & 1978b Study 2, Peterson et al 1984), 5-8 year olds (Gorn & Goldberg 1982/Gorn & Goldberg 1980b), 5-10 year olds (Kaufman & Sandman 1983), 4th graders (Stoneman & Brody 1981), 8-10 year old boys (Gorn & Goldberg 1980a), and 9-10 year old girls (Gorn & Florsheim 1985).

The food promotion stimuli in the experimental studies were adverts for branded sugared snacks and breakfast cereals (Goldberg et al 1978a & 1978b Study 1), a range of branded child-oriented foods (Borzekowski & Robinson 2001), 'sugared foods' (Goldberg et al 1978a & 1978b Study 2, Galst 1980), salty snacks (Stoneman & Brody 1981), sweets and soft drinks (Kaufman & Sandman 1983), a lemon-flavoured drink (Clarke 1984), cereal (Heslop & Ryans 1980), ice cream (Gorn & Goldberg 1980a), adverts for confectionery, fruit and 'pro-nutritional' PSAs (Gorn & Goldberg 1982/Gorn & Goldberg 1980b) and adverts for 'pronutrition foods' (Peterson et al 1984). Gorn & Florsheim (1985) were interested in how pre-adolescent girls responded to age-inappropriate products, and exposed subjects to adverts for lipstick and diet drinks, designating the former a product the respondents were likely to envisage themselves using in the next few years, and the latter a product they were unlikely to envisage themselves using in the next few years. In the Peterson et al (1984) study, the experimental stimulus was children's television programmes with a healthy eating theme plus five minutes of commercials or PSAs promoting "healthy eating habits and foods high in nutritional value" (the adverts are not described in the study. Cantor (1981) measured whether public sector nutritional messages had differential effects depending on whether they were humorous or non-humorous and on whether they were modified by being succeeded by a pro-sugar advert or an unrelated advert (a toy advert).

Full information on each study is provided in the data extraction sheets in Appendix 10.

Findings

The studies found evidence of both brand effects and category effects in relation to children's food preferences and behaviour. The findings are reported below according to the two types of effect.

(i) Brand Preferences

Five studies examined whether exposure to food promotion caused children to prefer the advertised

brand over a non-advertised brand in the same product category (Borzekowski & Robinson 2001, Clarke 1984, Heslop & Ryans 1980, Gorn & Florsheim 1985, Gorn & Goldberg 1980a). Borzekowski & Robinson (2001) found that exposure to adverts for a range of child-oriented food products significantly increased the likelihood of 2-6 year old children choosing the advertised food over a non-advertised similar product. After exposure to eight adverts for foods frequently advertised on children's television and one toy car advert, experimental group children were more likely than control group children to (had higher odds ratios) select the advertised brand in seven out of nine instances, when presented with the advertised and a non-advertised similar product. The two exceptions were the breakfast cereal, where both experimental and control groups preferred the advertised product, and the toy, where experimental children were not more likely to select the advertised product. Two adverts were shown twice on the tape, and these produced the biggest difference between groups (the experimental group was three times more likely than the control group to prefer the advertised product), suggesting an additional effect of exposure intensity.

Heslop & Ryans (1980) exposed equal number of 4-6 and 7-8 year olds to three different versions of cereal adverts. The three versions placed no, some and heavy emphasis on a free gift. Half the respondents exposed to each advert saw it once and half saw it three times. After exposure, children and their mothers (who had not seen the adverts) were invited to select one of three brands (one of which had been advertised) for each of five products. Children exposed to any of the cereal adverts, regardless of emphasis on free gifts and number of exposures, were more likely than the control group children (who had been shown a public service announcement) ($p=0.06$) to state in an interview that they preferred the advertised brand. However, the level of significance ($p=0.06$) would not be considered significant by current conventions. The two other preference measures (mother's report of child's actual selection, and the observed actual selection), exposure to the adverts had no effect. The relative emphasis placed on the free gift had no significant impact on any of the preference measures, nor did frequency of exposure make a significant difference.

Clarke (1984) examined the impact of food promotion on brand preference for a single food product, a lemon-flavoured drink. Exposure to adverts for a brand of lemon-flavoured drink had no effect either on brand or flavour preferences, regardless of whether the advert was shown once or four times, whether the preceding programme was enjoyable or unenjoyable, and whether or not food was served during screening.

Gorn & Florsheim (1985) found that exposure to advertising for a brand of diet drink had no effect on 9-10 year old girls' brand preferences when asked to select a diet drink for themselves or for a female teacher. The same study also found that exposure to the advertising had no effect on 9-10 year old girls' preferences (from a range of coffee, soft drink, diet, drink, milk and sugared drink) when asked to select a drink for themselves or for a female teacher. The hypothesis of the study was that the advertising would have no impact because the product was deemed inappropriate and lacking in salience for that age group.

Gorn & Goldberg (1980a) exposed experimental groups of children to either one, three or five repetitions of an advert for a specific ice cream, three or five different adverts for the same ice cream, or no adverts. Analysis of variance indicated that all experimental conditions had an effect on children's brand preference for the advertised brand over other brands ($F=2.59$, $df = 5, 105$; $p<0.05$). Newman-Keuls post hoc analysis indicated that those who viewed three different adverts

had significantly greater preference for the advertised brand than did those who viewed only one advert ($p < 0.01$). The preference scores for all other experimental groups fell in-between and no other significant differences were observed between any of the experimental groups. The same study also examined the impact of the advertising on children's choice from a range of snack foods, including ice cream. There were no significant differences between any of the groups with regard to first choice for a food snack (generic preference). However, children exposed to five different adverts were significantly more likely to select ice cream as their second choice (45% made this selection), compared with 10-15% in the other conditions ($p < 0.05$).

(ii) Preferences and Behaviour in Relation to Different Food Categories

Five studies examined whether exposure to food promotion caused children to select higher fat, sugar or salt products over lower fat, sugar or salt alternatives, in a one-off preferences test (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2, Stoneman & Brody 1981, Kaufman & Sandman 1983, Peterson et al 1984). The first Goldberg et al (1978a & 1978b Study 1) study asked 5-6 year old children to select snack and breakfast foods from boards depicting both "more wholesome", lower in glucose, higher nutrient value foods and "less wholesome", high glucose, lower nutrient value foods. Those exposed to adverts for sugared foods before the selection test selected significantly more sugared foods, when presented with in a post-experiment food preference test, than did children exposed to nutritional Public Service Announcements (12.58 vs. 8.70³), and there was a significant main effect on the number of sugared foods selected for sugared food adverts versus PSAs ($F=7.47$, $df=1,57$, $p < 0.01$). A similar study by the same authors took the same food preference measures after exposure to a nutritional programme alone or followed by either adverts for added sugar foods, or nutritional PSAs (Goldberg et al 1978a & 1978b Study 2). Children exposed to the programme and sugared food adverts subsequently preferred a greater number of sugared foods than children exposed to the nutritional programme without the food adverts or to PSAs, but the difference was not significant.

Stoneman & Brody (1981) found that 5-6 year old children exposed to adverts for salty snacks selected more salty snacks in a food preference test than a control group exposed to no adverts (5.35 vs. 3.75, $p < 0.01$), and that this effect was further reinforced when children were also exposed to a same age peer selecting the salty snack from each pair of foods; the effect was reduced, however, when the peer selected the non-salty snack. The study does not describe the 'common foods' used as alternatives to salty snacks.

Kaufman & Sandman's (1983) experiment with 5-10 year old children found that four different advertising exposure conditions had a significant influence on food preference scores when the influence of geographic area and pre-test food scores were controlled for in an analysis of covariance ($p < 0.01$). They reported that, at post-test, children exposed only to the sugared food adverts made fewer 'healthy food choices' (adjusted mean 49.76) than respondents in other conditions, children exposed to the counter-adverts (whether accompanied by sugared food adverts or not) made the most 'healthy food choices' (counter-adverts alone 61.40, counter-adverts plus sugared food adverts (60.93) and children exposed to the sugared food adverts with disclaimers fell

³ The p-value is not reported in the article.

between these groups (56.69). However, they did not report any levels of statistical significance to identify which group differences were significant.

Peterson et al (1984) found that ten days' exposure to a combination of nutrition programmes, nutrition PSAs and adverts for 'foods high in nutritional value' did not increase the likelihood of children selecting high nutrition foods over low nutrition foods in a complex series of food preferences tests. Nor was there an impact on children's consumption from a tray of low and high nutrition foods. Consumption was measured both before and after the ten days of experimental exposure. No significant treatment-by-trials interactions were obtained on any of the analyses. There was a tendency for experimental group children to consume more of the 'pro-nutrition' foods at post-test than children in the control group, but the differences were not significant. In other words, the experimental stimuli did not have a significant impact on food consumption behaviour. However, it was not possible to separate out the effect of the food advertising from the programme and public sector messages.

Three studies measured the impact of exposure to food promotion on children's daily selection of a snack or dessert, from more sugared and less sugared product categories. Gorn & Goldberg (Gorn & Goldberg 1982/Gorn & Goldberg 1980b) investigated the effects of confectionery adverts vs. fruit adverts vs. dietary PSAs on 5-8 year old children's daily snack food selections over a two week period. They found a significant treatment effect on children's drinks choices ($F(3,280) = 4.18, p < 0.01$), with children exposed to the fruit adverts selecting the most orange juice and children exposed to the sweets adverts selected the least orange juice (45% vs. 25%, $p < 0.05$). There was also a significant treatment effect on children's food choices ($F(3,280) = 5.32, p < 0.001$), with children exposed to the sweets adverts picking significantly less fruit (25%) than children in the other three groups (fruit adverts 36%, PSAs 35%, control 33%).

Cantor (1981) measured whether public sector nutritional messages had differential effects, on the daily dessert selections of 3-9 year olds, depending on whether the messages were humorous or non-humorous and on whether they were followed by an advert for sugared food or an unrelated advert (a toy advert). The relevant finding for the review is the additional impact, if any, of the sugared food advert. Children's daily choice of lunchtime dessert, from either fruit or a sweet pudding/cake, was recorded for one week before the experiment and for one week after the experimental exposure. Children exposed to the serious PSA plus the toy advert (ie. not exposed to the sweet dessert ad) made significantly fewer sweet dessert choices, and significantly more fruit dessert choices, after the experiment compared with children exposed to the serious PSA plus the sugared food advert and children exposed to the humorous PSA and the toy advert ($p < 0.05$). There were no significant differences in dessert choices between the two groups exposed to the humorous PSA either with or without the sugared food advert. In other words, children exposed to the serious PSA and the sugared food advert made more sweet dessert choices than children exposed to the serious PSA without the food advert, but a similar trend was not found for the humorous PSA. There was no comparison group exposed only to the sugared food advert, which would have enabled the impact of the sugared food advert to be better measured.

Galst (1980) exposed 3-6 year old children to adverts for sugared foods or non-sugared foods, viewed either with or without 'pro-nutritional' comments by an adult, daily for two weeks and measured their subsequent snack food selections. Control group children exposed to no adverts

requested significantly *more* sugared snacks than children in three of the experimental conditions: adverts for added sugar foods viewed without adult comments; adverts for added sugar foods viewed with adult comments; and adverts for non-sugared foods, viewed with adult comments. Children who were exposed to the adverts for non-sugared foods viewed with adult comments, requested significantly *fewer* sugared snacks than children in three of the conditions: adverts for added sugar foods viewed without adult comments; adverts for added sugar foods viewed with adult comments; and adverts for non-sugared foods plus dietary PSAs, viewed without adult comments. The presence or absence of adult pro-nutritional comments appeared to have no impact on the effect of sugared food adverts. Overall, exposure to the sugared food adverts appeared to 'improve' children's snack selection compared to the control group's selections. However, the study design did not permit the separation of the different advertising and advice influences, so it is difficult to assess the effect of the advertising element in this study, and the results should therefore be treated as inconclusive.

Discussion

Methods

The studies covered the age range 3-10. The majority of the studies were conducted in the 1980s, and all were North American.

Five of the studies were higher scoring in terms of quality (Goldberg et al 1978a & 1978b Study 1, Goldberg et al 1978a and 1978b Study 2, Gorn & Goldberg 1982/Gorn & Goldberg 1980b, Stoneman & Brody 1981, Kaufman & Sandman 1983), seven were medium scoring (Borzekowski & Robinson 2001, Cantor 1981, Galst 1980, Gorn & Florsheim 1985, Gorn & Goldberg 1980a, Heslop & Ryans 1980, Peterson et al 1984), and one was lower scoring (Clarke 1984). The two Goldberg et al (1978a & 1978b Study 1, 1978a and 1978b Study 2) studies were well-conducted and designed. The study which compared the impact of sugared food adverts with a nutritional PSA found a significant effect on preferences (Study 1), while the study which compared the impact of a nutritional programme modified in different ways, including the addition of sugared food adverts, did not find significant effects (Study 2). Stoneman & Brody (1981) was a good quality study involving random allocation of equal numbers of black and white children to each of four experimental conditions. The analysis was appropriate with a 4 x 2 factorial analysis of variance, with Newman-Keuls post hoc comparisons utilised to examine the influence, on snack behaviour, of adverts only and adverts combined with peer modelling.

Gorn & Goldberg (Gorn & Goldberg 1982/Gorn & Goldberg 1980b) was a well-designed and well-conducted study, and of direct relevance to the review. The study attempted to control for potential bias by 'blinding' summer camp workers to children's experimental group allocation, and to minimize response conformity by administering snack food selection on an individual basis. Kaufman & Sandman (1983) was a well-conducted study with a large sample (n=1,108), comprising all pupils in public schools in three cities. Food preferences were measured both before and after exposure to food promotion, and appropriate co-variate analysis was conducted to account for baseline differences. A relatively large impact of sugared food adverts on food preferences was found, and the size of the effect, combined with the large and mixed sample,

suggests that this study's findings should be given some weight. The study would have been strengthened had observed behaviour rather than stated preferences been measured.

Borzekowski & Robinson (2001) was a medium scoring study. Although a small sample, all children in the study population (a nursery school) were eligible for inclusion, and subjects were randomly allocated to experimental and control groups. The Cochran Q Statistic was used to test whether exposure to food commercials influenced food preferences and Student t and Chi-square tests were also used to compare control and treatment groups for significant differences in demographic characteristics and media use. The analysis was adequate given that the randomisation resulted in comparable treatment groups. Borzekowski & Robinson (2001) was one of the few studies to examine effects on low income children. Gorn & Goldberg (1980a) was also a reasonable quality experimental study. The design permitted analysis of the potential effects of exposure to varying degrees of advert repetition and to varied sets of adverts for the same product.

Two of the medium scoring studies (Cantor 1981, Gorn & Florsheim 1985) were of reasonable quality overall, but the effects and relationships they investigated were not as strongly relevant to this review as other studies. Cantor (1981) used a limited measure of consumption (one selection on the one day a week that a child attended the centre scored the same as five selections per week for a child who attended every day) and the study experienced a high rate of attrition. The main focus of the study was on comparing humorous and non-humorous public sector nutritional messages, and on examining whether their effects were modified at all by the addition of sugared food advert which might have 'undermined' the message. One sort of PSA, the serious one, was modified by the addition of the sugared food advert, but the humorous PSA was not affected by the addition of the sugared food advert. Few conclusions of relevance to this study can be drawn from this, and the study is therefore of lesser relevance. The Gorn & Florsheim (1985) study measured product and brand preferences in relation to a food product which the authors deemed to be of little current or future salience to the pre-adolescent sample, rather than in relation to a product intentionally targeted at, or consumed by, the study age group. It is possible that diet drink advertising might have more relevance to a pre-adolescent female target group now than in the early 1980s when the study was conducted. However, given the study's intentional focus on 'adult' products, the results from this study are probably of limited relevance to this particular review question.

Two of the studies, Galst (1980) and Peterson et al (1984), were medium scoring in terms of quality, but it was not possible to separate out the potential effects of the food advertising from other experimental stimuli examined at the same time: the absence or presence of adult nutritional advice in Galst (1980), and the presence of nutritional programming and PSAs in the Peterson et al (1984) study. In Peterson et al (1984) it was not possible to separate out the potential effects of the food advertising from other experimental stimuli examined at the same time (nutritional programming and PSAs). This limits the study's relevance, as it is difficult to draw conclusions about the effects of food promotion. Similarly, in Galst (1980) the study design did not permit the separation of the different advertising and advice influences, so it is difficult to assess the effect of the advertising element in this study, and the results should therefore be treated as inconclusive. Another difficulty with the study was that food selections were made in groups, rather than individually, so there may have been a peer influence effect on selections unrelated to the experimental variables.

Heslop & Ryans (1980) was a medium scoring study, although it had a poor response rate (13%). The use of fixed effects ANOVA appeared to be appropriate for the study design (3x2x2 factorial plus controls).

Clarke (1984) was a lower scoring study. It deployed a rather complicated design in which subjects effectively participated in two experiments and a large number of dependent measures were tested. The statistical analyses were poorly described. The primary focus of the study was the effects of advertising repetition, rather than of food advertising per se, and the study took only one preference measure relevant to this review, brand preference in relation to a single product (a lemon-flavoured drink).

Findings

The 13 studies reviewed in this section provide reasonably strong evidence that food promotion influences children's brand preferences *and* their preferences in relation to foods in different categories.

Of the five studies which examined whether food promotion influenced brand preferences, two (Borzekowski & Robinson 2001, Gorn & Goldberg 1980a) found that food promotion encouraged children to prefer the advertised brand over a non-advertised brand, one found only very modest effects in favour of the advertised brand (Heslop & Ryans 1980), and two found that it had no effect on brand preferences (Clarke 1984, Gorn & Florsheim 1985). Two of the brand effect studies also measured effects on product preferences: one (Gorn & Florsheim 1985), which took relatively limited measures, found no effect on product preferences, and one (Gorn & Goldberg 1980a) found a modest effect.

Of the eight studies which compared children's preferences or behaviour in relation to foods in different categories, four found that they were more likely to select higher fat, sugar or salt products (compared with lower fat, sugar or salt alternatives) in a one-off preferences test (Goldberg et al 1978a & 1978b Study 1, Stoneman & Brody 1981, Kaufman & Sandman 1983) or for a daily snack (Gorn & Goldberg 1982/Gorn & Goldberg 1980b). The fifth study (Goldberg et al 1978a & 1978b Study 2) found no significant effects on category preferences. Three of the studies produced results which were for various reasons inconclusive. In Galst (1980) and Peterson et al (1984), it was difficult to separate out the effects of food promotion from other elements of the experimental stimulus. Galst (1980) appeared to indicate that exposure to food promotion had an unexpected positive effect on consumption behaviour (ie. it reduced selection of sugared snacks), whereas Peterson et al (1984) found that exposure to food promotion had no effect, but food promotion was not measured and analysed separately from other exposure variables in the studies. Cantor (1981) found that exposure to food promotion under certain conditions increased children's tendency to consume more dessert foods from a 'sweet' category rather than fruit, but that under other conditions it did not have this effect.

A direct study of brand switching versus category effects would need to examine whether the same advertising had an effect on category choice, brand switching, or both. Most of the studies (eleven out of thirteen) reviewed here examined only one type of effect: eight examined category effects

only, and three examined brand effects only. Two studies examined both, although the main focus of the studies was on brand effects and one of the studies involved exposing children to promotion for an adult food product (a diet drink) which was intended to be of little salience to the subjects, to test the hypothesis that the advertising would have little effect (Gorn & Florsheim 1985). In neither study was the *relative* strength of brand effects versus category effects measured.

Overall, there is evidence that food promotion causes both brand switching *and* category effects. Although no study provides a thorough comparison of the strength of both types of effect, both types of effect have been examined independently, and there is reasonably strong evidence that both occur. In other words, the effects of food promotion are not limited to brand switching.

Conclusions from Systematic Review 2

There is modest evidence that food promotion has an effect on children's nutritional knowledge. Overall, the weight of evidence suggests that food promotion may have little influence on children's general perceptions of what constitutes a healthy diet, but that it can, in certain contexts, have an effect on more specific types of nutritional knowledge.

There is reasonably strong evidence that food promotion has an effect on children's food preferences. Overall, the better quality studies which addressed this question were more likely to find effects and the lower quality studies were not.

There is strong evidence that food promotion influences children's food purchase-related behaviour. All the studies which addressed this question found evidence of effects. In all except one study, the effect was in the direction of increasing purchase requests for foods high in fat, sugar or salt; in the remaining study, the effect was in the direction of increasing low fat snack sales, in line with the promotional stimulus examined in the study.

There is modest evidence that food promotion has an effect on consumption behaviour. Effects were sometimes inconsistent and were not found in all the studies, but were found in sufficient studies to suggest that food promotion can, in some contexts, influence children's food consumption.

There is reasonably strong evidence of significant associations between television viewing and diet, and between television viewing and health-related variables (obesity and cholesterol). The majority of studies which examine this question measure only television viewing in general, which raises questions about whether the effect is attributable to food advertising, programme content or the sedentary nature of the activity. However, one study measured the extent to which each subject was exposed specifically to food advertising rather than simply the amount of time spent watching television in general. The study found that the greater a child's food advertising exposure, the more frequent his or her snacking and the lower his or her nutrient efficiency.

There is evidence from higher and lower quality studies that food promotion or television viewing significantly influences children's food behaviour and diet independently of other factors known to influence children's food behaviour and diet. However, there is little evidence to show whether the

influence of food promotion on children's food behaviour and diet is greater or lesser than that of other factors.

There is evidence that food promotion causes both brand switching *and* category effects in relation to food preferences and consumption behaviour. Although no study provides a thorough comparison of the strength of both types of effect, both types of effect have been examined independently, and there is reasonably strong evidence that both occur. In other words, the effects of food promotion are not limited to brand switching.

Conclusions and Recommendations for Future Research

Conclusions

The first Narrative Review shows that promotion is just one part of the complex process of marketing, and that measuring its effects is notoriously difficult. Nonetheless, advertisers do it all the time and base enormous budgetary decisions on the resulting data. The second Narrative Review looks at the field of alcohol and tobacco promotion, showing that hard and fast proof about promotional effects will never emerge; rather, judgements have to be made on the balance of probabilities.

Systematic Review 1 indicates that children's food promotion is dominated by television advertising, and that the majority of this promotes pre-sugared breakfast cereals, confectionary, savoury snacks, soft drinks and, latterly, fast-food outlets. There is some evidence that the dominance of television has begun to wane in recent years. This review also shows that the advertised diet varies greatly from the recommended one, and that themes of fun and fantasy or taste, rather than health and nutrition, are used to promote this to children. Meanwhile, the recommended diet gets little promotional support.

Systematic Review 2 addresses the central question of whether this promotion actually has an effect on children. There are gaps in the evidence base, as discussed below. It is also impossible, as already noted, to provide incontrovertible proof of such effects. In our judgement, however, the review provides sufficient evidence to show that food promotion *can* have and *is* having an effect on children, particularly in the areas of food preferences, purchase behaviour and consumption. It is also clear that these effects are significant, independent of other influences and operate at both brand and category level.

Furthermore, two factors suggest that these findings actually understate the effect that food promotion has on children. First, the literature focuses principally on television advertising; as discussed below, the cumulative effect of this combined with other forms of promotion and marketing is likely to be significantly greater. Second, the studies have looked at direct effects on individual children, and understate indirect influences. For example, promotion for fast food outlets may not only influence the child, but may also encourage parents to take them for meals and reinforce the idea that this is a normal and desirable behaviour.

Most studies that uncover an effect conclude that this will be a harmful one. This is supported by the findings of the first systematic review showing a discrepancy between the recommended and advertised diets. However there is also evidence that promotion can have a beneficial effect, as in the vending machine study (French et al 2001) where promotion was shown to encourage a shift to lower fat options. Furthermore, there is no *prima facie* reason to assume that promotion will undermine children's dietary health; it can influence it, but this influence could just as easily be positive as negative.

It is this potential for benign influence that should form the focus of future research.

Recommendations for Future Research

The gaps in the literature confirm this need for a forward-looking research agenda:

- Research on the extent and content of children's food promotion comprises mainly content analysis studies. These tell us little about the advertisers' motives and objectives, or the audiences' response. Given that Narrative Review 1 clearly shows that both are actively involved in the communication process, future research should examine these two groups.
- The literature in both Systematic Reviews is dominated by television advertising studies. Other media and channels of communication are neglected, and the cumulative effect of modern brand-building 'integrated marketing communications' largely ignored. The even wider field of food *marketing* to children – which adds pricing, distribution and product design variables to the mix - is still less well explored. There is an urgent need for public health to learn more about such activities and particularly how they could be harnessed to encourage healthy food choices.
- The evidence on relative effects needs strengthening. In order to answer this question properly, different variables have to be monitored over time, and only one study did this. It showed that substantial reductions in the price of a snack item had a bigger impact on sales than did promotion. But even here the link between the two variables is difficult to separate out. Broader, longitudinal research is needed to put more of this jigsaw together.
- Systematic Review 2 revealed a need for more precision and realism. Precision concerns measurement and analysis tools: for example, studies seeking to examine the relationship between exposure to television food advertising and diet should take more precise measures of exposure than aggregate hours of television viewing per week and should conduct appropriate analysis to enable the independence and relative strength of each influence to be judged. Realism, on the other hand, is a function of research design. There is a clear need for more real world longitudinal experiments; they combine the rigour of experimental design with naturalistic measures of behavioural effect.

Filling these gaps will require a multi-faceted research programme along the lines of a full test market. This will involve selecting one or more television areas and manipulating or removing agreed promotional and marketing variables whilst monitoring children's dietary knowledge, attitudes and behaviour. This is new territory for public health, but, as discussed in Narrative Review 1, is a text book exercise for commercial marketers. It will take time and money, and perhaps most challengingly of all, will depend on full cooperation between the food industry and public health. Long term success will also need to recognise market forces, by incentivising the healthy and disincentivising the unhealthy.

However it does seem a logical next step. If a commercial marketer were trying to decide whether advertising is an effective way of promoting food products to young people, and were presented with the level of evidence in this review, one logical option would be to proceed to a full test market.

It would also bring enormous benefits, providing:

- coherent, comprehensive data on the capacity for a range of marketing techniques and strategies to influence children's eating in the real world, recognising that this influence can be both positive and negative.
- escape from the blame culture that pervades this issue, with interest groups on the one hand characterising food promotion as the villain of the piece, and the industry trying to vindicate it on the other.
- the opportunity to learn how marketers' proven skills in influencing food-related behaviour can be focussed on beneficial outcomes.
- an effective way forward for policy makers along with regular feedback on progress.

Most fundamentally of all, it will provide an innovative lead to the rest of the world in a field that is as contentious as it is important.

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Narrative Review 1

Narrative Review 2

Systematic Review Methods

Included Articles for Systematic Review 1

Included Articles for Systematic Review 2

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