OPRU Briefing Paper

Investigating the effect of food advertising on children's dietary intake

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Background

As part of the Obesity Policy Research Unit (OPRU) work programme, a review of the evidence of the quantitative effect of screen advertising on children's dietary intake and obesity was undertaken (part A). Researchers adopted a rapid systematic review methodology in collaboration with the Institute of Education. A secondary aim of the review was to identify the source of suggestions made by food and advertising industries that the effects of screen advertising on children's dietary intake were small (part B).

Part A

Database searches yielded 5,545 records, of which 382 were included after screening on title and abstract and 45 experimental and non-experimental (real-world) studies were included after full text screening. The findings from the systematic review will be published to the OPRU website in due course.

Part B

After conducting our systematic review searches and tracking-back various references of the 2% figure, we've concluded that the most likely source is a frequently cited paper 'Modeling the impact of television food advertising on children's diets' (Bolton, 1983). This paper reports that television food advertising accounts for 2% of the variance in children's snacking frequency. However this figure has been cited as the proportion that advertising influences on children's food choices and obesity levels (Livingstone, 2006). The paper was captured as part of the systematic review search and included after initial screening on title and abstract. However following full text screening, this paper was not eligible for our main analyses for quality reasons, as the indicators were not measured but modelled based on cross-sectional data. Here we outline our analysis of the most likely source of the 2% estimate from the Bolton article, including a discussion of the methodology and the validity of the estimate.

Analysis of Bolton 1983

The article by Bolton (1983) used complex statistical techniques (structural equation modelling [SEM]) to examine the impact of television food advertising on children's diet. Various theoretical constructs (described below) were considered with commercial exposure, children's nutritional intake (including snacking frequency, calories to meet nutritional need, calories to obtain nutrients efficiently and balance of nutrients) and other key mediators including parental supervision and child descriptors. Based on evidence reviewed at the time of the study, the model considered mediators with assumed relationships and associations. For example, it was assumed that intake of snacks was positively associated with parental snacks, with children's missed meals, and negatively with parental supervision of diet.

The paper sought to simultaneously address the effects of three factors on children's diets: television food advertising, parental influence and child demographic factors (including age, sex, birth order and socioeconomic status [SES]). Based on previous work (Churchill and Moschis, 1979; Ward, 1974), a framework was suggested which incorporated these environmental, social and behavioural influences. As is standard in SEM, two submodels were suggested: a) structural, to describe theoretical relationships; and b) measurement, to describe observed variables. The structural submodel included constructs for food commercial exposure and the four nutritional constructs. The theoretical constructs were operationalised using the measurement model in data from a small cross-sectional survey conducted by a market research company in 1977 in Cleveland, Ohio. The sample (n=262) comprised children aged 2-11, the majority of which were white and of high SES. Data included a 16 day television diary and a seven day food diary. The structural and measurement models were combined to give the SEM.

The model estimated that parental behaviour was the most important direct influence of children's behaviour. Parental snacking frequency accounted for 29% of the variance in children's snacking frequency, compared to advert exposure which accounted for 2%. Evaluation at the time suggested that the model fit was low but 'acceptable enough to provide insights'. A normal fit index for this SEM (scaled between 0 and 1) scored 0.80, and it has been suggested that a model which scored under 0.90 'could be improved'.

In addition to increasing snacking frequency, adverts were reported to reduce children's nutrient 'efficiency' but not caloric intake. Implying children may substitute high nutrient low calorie foods for low nutrient high calorie foods. The author noted that this would be consistent with the notion that adverts affect snack and meal preferences, and that even if caloric intake was not increased, food advertising would be impactful in terms of nutrient content and health.

Validity of the estimate

This was a highly statistical analysis of limited self- parent-report data from a small group of wealthy white US children from the 1980s. The amount of television watched by the group was low for a contemporary sample, and (given the SES background) it's likely that the level of obesity in the group was also low. SEM in the 1980s was in its infancy and the approach used today would likely be rather different. The approach in fact used five separate equations – and the way the 2% was calculated is extremely unclear. The 2% figure appears to arise from multiplication of coefficients, and it is not clear that this is valid. There is insufficient information given to judge the validity of this approach.

In fact, analysis of the paper suggests that the impact of television advertising is greater than this. The 2% figure refers to the *direct* effects of food commercial exposure on childrens' snacking, whereas there are also additional *indirect* effects of advertising on children's caloric intake. Further, later in the paper the authors estimate adjusted R^2 for each of the five subsidiary equations run as an ordinary least squares (OLS) model, as an overall estimate of the proportion of variance explained for the entire SEM model could not be calculated. They quote an adjusted R^2 for children's commercial food exposure as 0.23, i.e. suggesting that this explains 23% of the variance – very different to 2%.

The study also highlighted that there were limitations with the model, which could be improved with more accurate measures and replication. Exposure to advertising was estimated by self-reported survey data relating to television viewing time; exposure was calculated using reported days and times, cross referenced with television broadcast data. Self-reported recall of television viewing is likely to be subject to inaccuracies, particularly underreporting owing to social desirability bias (Pettee et al., 2009), and in this study was coupled with potential error arising from estimated advert exposure based on television viewing. Without an accurate measure of advert exposure, deriving causal conclusions regarding its impact on snacking frequency is unlikely to be reliable.

There were potential limitations in terms the assumptions built into the model; notably that child's caloric intake is positively associated with increased snacking. The evidence relating to snacking and obesity is unclear, while some studies suggest high snacking frequency is associated with increased risk of overweight and abdominal obesity among adolescents, other research has found adolescents who snacked (compared to non-snackers) were less likely to be overweight or obese (Murakami and Livingstone 2016; Keast, Nicklas and O'Neil, 2010).

There were also limitations in terms of the cross-sectional data; the sample of children were not diverse or representative in terms of ethnicity or SES. Participants also reported viewing 19 hours of television per week compared to the national average at the time of 30 hours. The under-reporting was not suggested to affect analyses as it was based on covariance structures; however, the sampling bias limits the extent to which findings can be generalised to a wider sample. The study concluded that television food adverts affect nutritional status and that such impacts were likely to be more pronounced for less well-nourished children. It is well established that children of lower SES in developed countries are more likely than their wealthier counterparts to consume food of lower nutritional value (Nilsen et al., 2010; Mullie et al., 2010); however, children from lower SES groups were not represented in this study. The cross-sectional survey was also conducted in 1977, since which time there have been substantial changes both in terms of marketing effectiveness and strategy, and the global food market.

In conclusion, we feel that there are very major limitations to this work, not least in the lack of clarity in how analyses were conducted and apparently very different potential conclusions (e.g. 23% rather than 2%), meaning that caution is required when interpreting these findings.

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