A Literature Review on the Effects of Breakfast Consumption and School Breakfast Clubs

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Introduction

This paper reviews the academic literature that has been published on children's breakfast consumption and the impact of school breakfast clubs on children's diet, health, and educational success.

In showing an overall positive impact – particularly on children's health, but with some encouraging signs too of a correlation between school breakfast club provision and improved cognitive skills, test results, attendance, punctuality, relationships, and behaviour – the paper also seeks to locate this policy initiative within the broader context of social norms and psychosocial factors which influence breakfast consumption.

It is that broader context, alongside a determination to ensure this educational intervention provides the best possible value for money, which leads us to conclude that school breakfast provision must be fully integrated into the school day and aligned with budgets for free school meals and after-school provision.

The UK Government has given a welcome commitment to extend the National School Breakfast Programme until March 2021. The Programme is delivered by Family Action and Magic Breakfast and aims to increase the number of school breakfast clubs in a certain number of deprived areas.

This paper attempts to illustrate the path to an effective longer-term strategy which produces optimal outcomes for children from disadvantaged backgrounds, their families, and taxpayers.

Recommendations

1. Primary legislation should build on the National School Breakfast Programme, by ensuring all children and young people can access a nutritious, healthy breakfast every day. Feeding Britain will be working with partners, including Magic Breakfast, to draft such legislation.
2. Appropriate levels of funding need to be made available for school breakfast provision.
3. All funding related to food provision in schools, whether school meals or breakfast, should be ring-fenced within school budgets so that taxpayers can see clearly how much expenditure is allocated towards children's meals.
4. School breakfast provision should be fully embedded within the school day, as part of a cohesive year-round food offer for children. This will promote social norms and good behaviour, and mitigate risks of double or triple breakfasting, or breakfast skipping.
5. Biometric data and digital platforms should be used within this seamless year-round system to reduce the administrative burden on staff as well as the accompanying financial costs.
6. Food and drink provision must comply with School Food Standards and all food provision activities in schools should face regular inspection.
7. Secondary schools, in particular, should be encouraged to adopt new and innovative breakfast club models in an attempt to maximise take-up among their pupils.

Breakfast Consumption

Overall there is strong evidence regarding the positive benefits of habitual breakfast consumption. The importance of breakfast, in terms of outcomes associated with health, is relatively well documented, particularly in the case of children and adolescents, and research suggests that children who habitually consume breakfast typically have superior nutritional profiles, compared to their peers who skip breakfast (Rampersaud, Pereira, Girard, Adams, & Metzl, 2005). Whilst the quality and composition of breakfast across and within studies is variable, research has consistently demonstrated that breakfast consumption is associated with more healthy food choices and dietary behaviours amongst children and adolescents (e.g. Lattimore & Halford, 2003; Pedersen, Meilstrup, Holstein, & Rasmussen, 2012). Moreover, breakfast consumption is associated with a lower risk of being overweight and obese (Elgar, Roberts, Moore, & Tudor-Smith, 2005; Huang, Hu, Fan, Liao, & Tsai, 2010), and reduced risk of chronic illness (Huang et al., 2010). Whereas, skipping breakfast has been associated with inadequate diets (Rampersaud, 2008; Serra-Majem et al., 2002), including increased consumption of snack foods, decreased consumption of fruits and vegetables (Resnicow, 1991; Utter, Scragg, Mhurchu, & Schaaf, 2007), and omission of other meals (Sjöberg, Hallberg, Höglund, & Hulthén, 2003). Moreover, skipping breakfast has also been associated with an increased likelihood of other detrimental health risk behaviours, such as lack of physical activity, weight control behaviours, smoking and alcohol consumption (Rampersaud, Pereira, Girard, Adams, & Metzl, 2005; Revicki, Sobal, & DeForge, 1991; Timlin, Pereira, Story, & Neumark-Sztainer, 2008).

Skipping Breakfast

In spite of the benefits, breakfast remains the most frequently skipped meal, amongst children and adolescents (Deshmukh-Taskar et al., 2010; Hoyland, Mcwilliams, Duff, & Walton, 2012; Rampersaud, 2008). Research has also demonstrated that breakfast skipping behaviours have an increased prevalence amongst adolescents, females, and low socioeconomic and certain ethnic minority groups (Barton et al., 2005; Malinauskas et al., 2006; Rampersaud et al., 2005; Siega-Riz, Popkin, & Carson, 1998; Song et al., 2006; Sweeney & Horishita, 2005). Key concerns regarding frequent breakfast skipping are the prolonged effects of nutritional inadequacy and detrimental dietary patterns on health outcomes (Baer et al., 2003; Law, 2000; Rampersaud et al., 2005; Viteri & Gonzalez, 2002). Research has shown that children and adolescents do not tend to recompense for the nutritional deficits from skipping breakfast at other meals throughout the day (Rampersaud et al., 2005). This is a matter of concern because it is considered that nutritional intakes impact on growth and development for children and adolescents, and long-term micronutrient intakes have a significant role in decreasing the likelihood of developing chronic disease (Ames, 1998; Willett, 1994). Conversely, habitual breakfast consumption is thought to reduce the risk of chronic diseases, via its effect on overall diet, and associations have been reported with better diet quality and food choices throughout the rest of the day (Giovannini, Agostoni, & Shamir, 2010). Moreover, numerous studies have demonstrated that habitual breakfast consumers have superior diet quality, i.e. increased dietary fibre, and micronutrients including calcium, vitamins A and C, riboflavin, zinc and iron (Giovannini et al., 2010; Rampersaud et al., 2005).

Breakfast skipping has also been associated with detrimental health behaviours, such as weight control behaviours, lack of physical activity, increased snacking and poorer food choices, and increased prevalence of smoking (Cohen, Evers, Manske, Bercovitz, & Edward, 2003; Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003). It has been suggested that breakfast skipping is used as a method of weight control, especially amongst females, adolescents, and overweight children and adolescents (Boutelle, Neumark-Sztainer, Story, & Resnick, 2002; Currie et al., 2012; Rampersaud et al., 2005; Vereecken et al., 2009). For example, a large-scale cross-national study, examining health behaviours in school-aged children, reported that those who skipped breakfast were more likely to be on a diet and express concerns about body image (Currie et al., 2012; Vereecken et al., 2009). Moreover, UK based research has demonstrated that female adolescents are far more likely to skip breakfast, and have expressed body dissatisfaction and/or

been on a diet, than their male counterparts (Lattimore & Halford, 2003). Similarly, females within a UK sample of adolescents who were currently dieting, were more likely to skip breakfast (Barker, Robinson, Wilman, & Barker, 2000).

In addition to weight control behaviours, breakfast skipping has also been associated with low levels of physical activity (Cohen et al., 2003; Currie et al., 2012; Rampersaud et al., 2005; Vereecken et al., 2009). For example, a US based study, examining associations between breakfast consumption and physical activity amongst secondary school children (N = 318), reported that those children who habitually skipped breakfast were less likely to engage in frequent physical activity (> 3 x per week) (Cohen et al., 2003). Likewise, a population level study, investigating sociodemographic factors and behaviours associated with breakfast skipping, amongst five birth cohorts of adolescent twins and their parents, found that infrequent physical activity was significantly associated with adolescent and adult breakfast skipping (Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003). Moreover, a large-scale survey study examining the associations between health related behaviours, social relationships, and health status with persistent physical activity and inactivity, amongst a sample of Finnish adolescent twins (N = 5028), reported that irregular breakfast eating was significantly associated with persistent inactivity (Aarnio, Winter, Kujala, & Kaprio, 2002).

The Effect of Breakfast on Cognition

A crucial factor in cognitive functioning is the supply of metabolic fuel to the brain in the form of glucose, which comes from foods containing carbohydrate foods and is produced in the body from non-carbohydrate sources (Bellisle, 2004). The supply of glucose to the brain is sustained by complex mechanisms, which ensure that the presence of glucose in the blood (glycaemia) is maintained at appropriate levels. In terms of nutrition, glucose is a carbohydrate and an important monosaccharide or 'simple sugar,' acting as one of the primary molecules that serves as an energy source for the brain, nervous system and red blood cells (Scientific Advisory Committee on Nutrition, 2015). It is therefore understood that inadequate nutritional intake may have adverse effects of cognition, and thus correction of nutritional deficiencies may improve cognitive functioning and performance (Bellisle, 2004). Breakfast is considered to be of particular importance, because it replaces glycogen stores and raises blood sugar levels following the utilisation of energy during the night and the depletion of glucose supplied from carbohydrates consumed during the previous day (Waggoner, 2001). Breakfast interrupts the overnight fasting period and provides necessary fuel to the brain in order for efficient cognitive functioning (Bellisle, 2004). It is thought that children are more susceptible to the effects of overnight fasting because of increased metabolic demands (Pollitt, Leibel, & Greenfield, 1981). Consequently, breakfast consumption is deemed crucial in replacing glycogen stores for children and adolescents, and providing them with adequate energy across the morning to sustain mental and physical work at school.

Cognitive performance is assessed using measures that test specific dimensions of intelligence, including functions such as memory, reasoning, attention, and psychomotor coordination (Bellisle, 2004). Memory is also characterised as a set of cognitive processes that contribute to overall cognitive performance, i.e. short-term, long-term, visual, spatial, verbal, declarative, semantic, strategic, all of which can be assessed using various measures. In addition to the complex functions that are involved in cognitive performance, factors such as an individual's skills, motivation, past learning, and fatigue also contribute to overall performance. Due to the complexity of cognition and the number of extraneous factors that may affect performance, assessing the impact of nutrition on cognitive performance is complex. Although, it is considered that some aspects of cognitive performance may be improved following the intake of glucose or carbohydrate rich foods (Bellisle, 2004).

Inadequate nutrition, due to children skipping breakfast, may be a contributing factor to poor cognitive performance and behaviour amongst children across the school morning, as children may lack the

necessary energy to cope with the requirements of school activities. The mechanisms linking breakfast consumption and cognitive performance are assumed to be both physiological (metabolism of glucose) and subjective (changes in feelings and subjective state including mood and alertness, and alleviation of hunger) (Widenhorn-Müller, Hille, Klenk, & Weiland, 2008). Moreover, research examining the impacts of breakfast consumption on children's cognitive performance has shown that beneficial effects are more pronounced amongst undernourished children (Adolphus et al., 2016; Cueto, 2001; Grantham-McGregor, 2005). However, findings are inconclusive, with positive and null effects observed in specific cognitive domains, and effects only being evident during cognitively demanding tasks and/or within subgroups such as undernourished and deprived groups (Defeyter & Russo, 2013). A common limitation in studies includes fixed breakfast conditions not representative of habitual eating patterns, which limits the ability to generalise to real life contexts. Studies have focused on the effects of breakfast consumption versus omission, breakfast composition, and school breakfast consumption/attendance. Fewer studies have been undertaken examining the prolonged effect of school breakfast programmes on cognitive performance.

Breakfast Composition and Cognition

Glycaemic index (GI) and glycaemic load (GL) are both measures of the glycaemic characteristics of foods. GI is a measure of the blood glucose response to a particular ingredient or food, specifically the blood glucose raising and maintenance potential of the carbohydrate in different foods (Scientific Advisory Committee on Nutrition, 2015). GI is a ranking of foods from 0 to 100, which provides an indication of whether the carbohydrate in a food or meal will raise blood glucose levels significantly, moderately, or minimally. Low GI carbohydrate containing foods take longer to digest, absorb, and metabolise, and thus result in less rapid, and more moderate sustained increases in blood glucose levels. Low GI is < 55, medium GI is rated between 56 and 69, and high GI is > 70 (Venn & Green, 2007). GL considers both the quality of the carbohydrate food and the amount of available carbohydrate it contains, i.e. the blood glucose raising potential of the carbohydrate in a particular food and the quantity of carbohydrate in a food (Scientific Advisory Committee on Nutrition, 2015). GL describes the overall effect of these two factors on blood glucose levels. GL is calculated by multiplying the amount of carbohydrate in a food by the GI of the food and dividing the result by 100 (Benton, Maconie, & Williams, 2007). Low GL is < 10, medium GL is between 11 – 19, and high GL is > 20 (Venn & Green, 2007). Variation in the GI and GL of foods reflects differences in the rates of carbohydrate digestion and absorption, in addition to the differences in the rates of glucose production and distribution from circulation into tissues (Scientific Advisory Committee on Nutrition, 2015).

Following intake of high GI/GL foods there is a rapid rise in blood glucose levels, ensued by a corresponding decrease in blood glucose (Ingwersen, Defeyter, Kennedy, Wesnes, & Scholey, 2007). Whereas, following consumption of low GI/GL foods there is a smaller increase in blood glucose, ensued by more stable levels of blood glucose (Ingwersen et al., 2007). It is suggested that the consumption of low GI/GL breakfasts may be beneficial to cognitive functioning later in the morning, due to a slower rate of glucose release (Benton et al., 2007; Mahoney et al., 2005). Nevertheless, in studies examining the associations between slower rates of glucose release and better cognitive performance across the mornings there are many differences in the nutritional profiles of the breakfast meals provided, and thus observed effects may be the result of other nutritional mechanisms (Benton et al., 2007).

For example, a study with UK children (N = 64; 6-11 years) investigated the effects of high GI and low GI cereals on attention and memory (Ingwersen et al., 2007). Participating children were provided with servings of either Coco Pops (high GI: 77) or All Bran (low GI: 42) with semi-skimmed milk, over two consecutive days. Following an overnight fast, children were tested at 9:00am (baseline), breakfast was provided at 9:30am, and children were tested again at 9:40am, 10:40am and 11:40 am. Attention and memory were assessed utilising a cognitive testing battery, consisting of nine consecutive tasks, including word presentation; immediate word recall; picture presentation; simple reaction time; digit vigilance; choice

reaction time; spatial working memory; numeric working memory; delayed word recall; delayed word recognition, and delayed picture recognition. Results showed a significant main effect of GI on secondary memory, with better performance following consumption of low GI cereal, compared to high GI cereal. However, results also showed no significant main effects of GI on speed of attention, speed of memory, and working memory. Further analysis showed a significant decline in accuracy of attention, at 11.40am, for the high GI cereal condition compared to the low GI condition.

Comparatively, another study with USA elementary school children (N = 30; aged 9 -11) examined the effects of breakfast composition on cognitive processes (Mahoney et al., 2005), with mixed results. Children were recruited from a middle-class background, within a private elementary school. Tests of cognition focused on spatial memory, short-term memory, visual perception, visual attention, auditory attention, and verbal memory. In addition, children completed questionnaires to assess their mood, energy level, and hunger level before breakfast, and before and after testing. Children participated in the study at school for one day per week for four weeks and were instructed not to consume anything after 10:00pm the previous evening. On testing days, children completed a questionnaire and participated in one of three breakfast conditions; including either ready to eat cereal and fat free milk, instant oatmeal and fat free milk, or no breakfast, then were tested an hour later. Children received all three breakfast conditions; thus, acting as their own control. Results of the spatial memory tasks showed that children performed better after consuming the oatmeal breakfast, followed by ready to eat cereal, and finally the no breakfast condition. Moreover, results of the short-term memory tests showed that girls performed better when they ate oatmeal, but no performance differences by meal were observed in boys. In the visual perception tasks, when children consumed either oatmeal or ready to eat cereal, scores were better than no breakfast. However, no effect of breakfast condition was found on the visual attention test scores. Analysis of the hunger rating scores predictably showed that children rated themselves as more hungry when they did not receive breakfast, but there were no differences on how tired, happy, relaxed, thirsty, alert or stressed children were feeling between conditions. The results of this study indicate that, for some cognitive tasks, the composition of breakfast may influence performance; or the cognitive task is not sensitive to nutritional manipulation.

A systematic review, examining the acute effects of breakfast on cognitive performance in children and adolescents, found evidence that breakfast consumption, relative to fasting, has temporary domain specific effects, specifically in tasks requiring attention, executive function and memory (Adolphus et al., 2016). Despite this, findings are inconclusive, with some studies reporting mixed results and null effects in particular domains, and a lack of consensus on the specific cognitive processes affected by breakfast consumption (Adolphus et al., 2016; Rampersaud et al., 2005). Moreover, studies examining the effects of breakfast versus no breakfast on cognitive performance vary in terms of the breakfasts served, test timings, and age, which are all considered to contribute to the mixed research findings (Defeyter & Russo, 2013). Furthermore, in addition to the role of glucose as a mediator for cognitive performance and functioning, it is also proposed alleviating hunger may result in improvements in mood and thus cognitive performance (Defeyter & Russo, 2013). Therefore, a number of studies examining the effects of breakfast consumption on cognitive performance have also examined the effects on mood using self-report measures, providing evidence that breakfast is beneficial in terms of feelings of satiety, alleviating hunger and improving mood (Cooper, Bandelow, & Nevill, 2011; Defeyter & Russo, 2013; Widenhorn-Müller et al., 2008).

School Breakfast Provision

School breakfast provision generally aims to achieve a range of objectives, although a primary aim is considered to be the contribution to the improvement of the health and nutrition of children (Harrop & Palmer, 2002). School breakfast is advocated to improve the health of children for a number of reasons (Harrop & Palmer, 2002). For example, children may live in homes with medium/high levels of household food insecurity, or children may consume high calorie foods and beverages at home or on the way to

school. Moreover, children may miss breakfast due to rushed or chaotic mornings or may arrive to school hungry after long journeys to school (Harvey-Golding, Donkin, Blackledge & Defeyter, 2015). Additionally, children may skip breakfast at home due to a lack of hunger early in the morning; this applies especially to secondary school pupils who often have different diurnal sleep patterns compared to younger children and may be one of the reasons that more primary schools offer breakfast clubs compared to secondary schools. Research has indicated that there may be a number of positive health outcomes relating to school breakfast provision, primarily associated with improved nutritional intake (Bhattacharya, Currie, & Haider, 2006; Kleinman et al., 2002; Murphy et al., 2011; Harvey-Golding et al., 2015).

A population level study, investigating the effects of a USA School Breakfast Programme (SBP) on children's nutritional and health outcomes, reported that SBP substantially improved the nutritional quality of children's diets (Bhattacharya et al., 2006). The SBP, which is administered by the United States Department of Agriculture, through its Food and Nutrition Service (FNS), provides nutritionally balanced breakfast meals to children from low socioeconomic backgrounds each day. The study utilised data gathered from children (N = 4841; 5-16 years) as part of the National Health and Nutritional Examination Survey; a nationally representative survey on diet, demographics, and health, which collects data on dietary intakes, and laboratory tests of blood and urine. Results showed that children with SBP available were more likely to live in low socioeconomic families. Moreover, results showed that nutritional outcomes tended to be worse for children eligible for the SBP. This included being less likely to consume breakfast, especially outside of school time, being more likely to consume a higher number of calories from fat, and having low serum values of vitamins A, C, and E, and folate. Further analyses indicated that the SBP significantly improved the diets of children eligible for SBP, with fewer calories consumed from fat and increases in intakes of fibre, vitamin C, vitamin E, folate, potassium and iron. Additionally, the study found that the SBP had no effect on the total number of calories consumed, indicating that SBP may not contribute to increases in overweight and obesity.

Comparatively, a cluster randomised control trial evaluating the impact of a universal free primary school breakfast initiative in Wales, UK, on a range of dietary outcomes, reported an increase in healthy food items consumed at breakfast amongst children attending intervention schools (Murphy et al., 2011), with similar findings reported by Harvey-Golding and Defeyter (2015) in a study examining the impact of a universal free breakfast scheme in Blackpool, UK. The Welsh Government's Primary School Free Breakfast Initiative (PSFBI) was introduced as a result of a manifesto commitment to provide free healthy breakfasts to all children attending state maintained primary schools in Wales. Collaborations between the research team and the Welsh Government allowed for a control condition, as some schools were asked to refrain from delivering the breakfast scheme during a 12-month evaluation period. The study encountered issues with 10 of the 55 intervention schools failing to implement the school breakfast scheme, and five of the 56 control schools setting up a breakfast club during the 12-month study period.

The trial examined the impact of the school breakfast intervention on a number of health outcomes including breakfast skipping, breakfast diet, frequency of breakfast consumption at home and school, and rest of day diet, in addition to other non-health outcomes, at baseline and 12 month follow-up. Participants including primary school children aged 9-11 years (N = 4350 baseline; N = 4472 follow-up) from 111 schools. A validated dietary recall questionnaire, the 'Day in the Life' questionnaire (Edmunds & Ziebland, 2002; Moore et al., 2007), was utilised to gather data on the foods consumed by children for breakfast on the day of reporting, followed by the previous days consumption. Foods consumed for breakfast for the two days were dichotomised into food groups, then categorised into two variables: healthy (fruit, bread, cereal and milk products) and unhealthy (sweets and crisps). Results showed that children attending breakfast intervention schools reported consuming significantly higher numbers of healthy items for breakfast at 12 months, compared to their peers in the control condition. However, results also showed no significant differences in the number of unhealthy items consumed for breakfast, or in healthy and

unhealthy items consumed across the rest of the day between intervention and control conditions. Furthermore, results indicated that the breakfast intervention did not reduce rates of breakfast skipping, and parental questionnaires showed children substituted breakfast at home for breakfast at school. This study examined the relatively long-term (12 months) impacts of universal free school breakfast provision in the UK, and addressed some of the methodological shortcomings present in previous similar studies, such as small sample sizes, lack of randomisation and appropriate control groups, and contamination between treatment arms. However, the findings on dietary outcomes were dependent upon self-report measures of dietary behaviour, and whilst the measures were previously validated, they are still subject to social desirability bias and misreporting (Stone, 2000).

Comparably, a randomised control trial examined the impact of universal free school provision on school breakfast participation and children's dietary outcomes, in 153 USA elementary schools (Crepinsek, Singh, Bernstein, & McLaughlin, 2006). Schools that offered universal free school breakfast participated in the treatment condition, and schools that continued to offer a means tested school breakfast programme participated in the control condition, with no differences in the nutritional composition of school breakfast provided in either conditions. Data were gathered via a 24-hour dietary recall from randomly selected children (N = 4,358) and their parents, near the end of the first year of the school breakfast pilot programme. Results showed that the introduction of universal free school breakfast led to significant increases in school breakfast participation, and after 1-year participation rates increased from 16% to 40%. Children who attended treatment schools were more likely to consume breakfast at school, compared to those attending control schools, who were more likely to eat breakfast at home.

Moreover, the likelihood of children consuming a nutritionally substantive breakfast was significantly higher amongst children attending treatment schools, with higher intakes of calcium, magnesium, and phosphorous, and lower intakes of cholesterol. However, the nutritional differences observed disappeared in all but cholesterol when intakes were analysed over a full day, suggesting that providing universal free school breakfast made little difference to daily nutritional intake. Furthermore, findings also did not show any indication that universal free school breakfast reduced breakfast skipping amongst children, as no significant differences were reported between treatment and control schools on the likelihood of consuming breakfast on a school day. In addition, children who ate breakfast at home and school (two breakfasts) had higher energy intakes at breakfast and over 24 hours, compared to those children who only consumed one breakfast.

Breakfast Consumption and Educational Outcomes

Research has also investigated the impact of breakfast consumption on educational outcomes in terms of school grades and academic achievement test scores. A systematic review concluded that generally habitual breakfast consumption is positively associated with academic performance in children and adolescents (Adolphus, Lawton & Dye, 2013). However, whilst positive effects of breakfast and school breakfast have been observed in test scores, specifically numeracy, arithmetic and literacy (Kleinman et al., 2002; Murphy et al., 1998; O'Dea & Mugridge, 2012), additional research is required on whether a direct link exists between breakfast consumption and longer term attainment (PHE, 2013). This is partly due to a lack of longitudinal studies measuring the long-term effects of breakfast and school breakfast on academic outcomes (Adolphus, Lawton, & Dye, 2013). It is also suggested that this lack of evidence may be attributed to the complexities in defining, identifying and measuring the effects of breakfast and school breakfast on educational outcomes (Littlecott, Moore, Moore, Lyons, & Murphy, 2016).

Furthermore, previous studies have been criticised for inadequate adjustment for numerous confounding variables. For example, confounding factors in assessing educational attainment may include the school environment (facilities, quality of teaching, class sizes); participant backgrounds (socioeconomic status, parental educational level and attitudes towards school); and individual characteristics (gender, age, health,

nutritional status, aptitude, motivation and behaviour) (Edefonti et al., 2014). However, two cross-sectional studies have reported that regular breakfast consumption is associated with higher academic achievement (Stea, T., Torstveit, M., 2014; Littlecott HJ, Moore GF, Moore L, Lyons RA, Murphy S.,2016).

More recently, a study by Adolphus et al. (2019) investigated whether there is a relationship between eating breakfast regularly on school days and GCSE attainment. The researchers categorised the breakfast eating habits of 294 adolescents as either rare, occasional or regular. It should be noted that breakfast consumption was defined as the first eating occasion of any food or drink containing total energy expenditure up to and including 10.00am.The researchers also calculated the adolescents' GSCE scores across all subjects to give an aggregated/total score. The results showed that those adolescents who self-reported that they rarely eat breakfast on school days achieved nearly two grades lower than those who regularly ate breakfast on school days. However, the researchers did not collect data on whether schools ran a breakfast club. These findings are consistent with a Norwegian study that found regular breakfast consumption was associated with high self-reported academic achievement (Stea T, Torstveit M., 2014. However, further research is required to ascertain whether altering the breakfast habits of adolescents alters their academic achievement. Also, there was a recruitment bias of high achieving adolescents in which lower SES and ethnic minority groups were underrepresented. Furthermore, it is important to note that the researchers found that approximately a third of their participants rarely ate breakfast; supporting the need for secondary schools to have school breakfast clubs. Given the relatively low take-up of this offer across England, other models of breakfast club delivery need to be considered.

School Breakfast Clubs and Educational Outcomes

It is considered that interventions which aim to improve educational outcomes based on education alone are largely ineffective, and in order to be effective they should also focus on children's health and wellbeing (Littlecott et al., 2016). Therefore, by alleviating hunger, school breakfast programmes may improve health and nutrition, and subsequently improve the potential educational attainment.

A USA based study investigated potential relationships between participation in a Universal Free School Breakfast Programme and measures of psychosocial and academic functioning in school children (Murphy et al., 1998). Data on educational outcomes, including academic achievement (test grades in mathematics, science, social studies and reading), and school attendance and punctuality, were obtained via school records, for children (N = 133; mean age 10.3 years), from three inner city public schools. Data collection took place prior to the implementation of a universal free school breakfast programme (baseline) and four months afterwards (follow-up). The exact nutritional composition of breakfast was not determined, and the authors noted that consumption of school breakfast was observed by researchers, who deemed that most of the children ate most of their breakfast meals. However, schools were required to provide nutritionally balanced meals as part of the breakfast programme.

Results showed that prior to the introduction of the school breakfast programme, students who ate school breakfast 'often' (ate breakfast on > 80% days present) or 'sometimes' (ate breakfast between 20% and 79% days present), had significantly higher mathematic test scores. However, grades in science, social studies and reading were not related with school breakfast participation at baseline. Furthermore, results from follow-up data, after the implementation of the school breakfast programme, showed that participation in school breakfast had almost doubled. Amongst those who increased their participation in school breakfast, significant increases in mathematics grades were also observed. Additionally, follow-up data showed that children who 'rarely' (< 20% days present) participated in school breakfast were absent from school and late significantly more than those who attended school breakfast 'sometimes' and 'often.' There are limitations in interpreting the findings from this study, as the results were based on participation in school breakfast, and the actual consumption of school breakfast was not established. Therefore, the mechanisms

driving the observed effects in this study, i.e. nutritional, social and/or environmental impacts of school breakfast, cannot be ascertained.

A further USA based study examined associations between nutrient intake, and academic and psychosocial functioning, amongst USA school children (N = 97), following the introduction of universal free school breakfast (Kleinman et al., 2002). Academic achievement data, including grades for mathematics, reading, science and social studies; data on school attendance and punctuality; and school breakfast participation data, were obtained from school records. School breakfast participation was characterised at often (> 80% days present), sometimes (between 20% and 79% days present) and rarely (< 20% of the days present). However, unlike the aforementioned study, dietary data for the previous 24 hours were gathered utilising a validated dietary recall method. In addition, the 'nutritional risk' of children was determined using data on hunger and food insufficiency gathered from parents and children using a validated questionnaire. Data collection took place at the start of the implementation of a school breakfast programme (baseline) and again six months later (follow-up). Prior to the implementation of the school breakfast programme, 33% of children were classified as at nutritional risk (energy intakes < 50% of RDA and/or 2 or more micronutrients < 50 % of RDA). As a group, those at 'nutritional risk' demonstrated poorer attendance, punctuality and grades, had more behaviour difficulties, and were less likely to eat breakfast at school. Results showed that children who consumed school breakfast 'rarely' were significantly more likely to be at 'nutritional risk' than children who ate school breakfast 'sometimes' and 'often.'

Follow-up data reported that 19% of the sample improved their 'nutritional risk,' 64% remained unchanged, and 18% were at increased 'nutritional risk.' Moreover, those students who decreased their 'nutritional risk,' also significantly increased school attendance and school breakfast participation, showed improvements in mathematics grades, and reported significant decreases in hunger. Similar to the study by Murphy et al. (1998), mathematics was the only subject found to be significantly associated with nutritional intake, with no effects reported in any of the other academic subjects.

Comparatively, a mixed methods evaluation of the Magic Breakfast project, which employed a cluster randomised controlled trial, examined the effects of school breakfast on academic achievement (Crawford et al., 2016). Jointly funded by the Department for Education and the Education Endowment Foundation, the Magic Breakfast project provided 106 primary schools in England, with relatively high proportions of disadvantaged pupils, free food, support from a Magic Breakfast school change leader, and a £300 grant to deliver a universally free before school breakfast club. The primary objective of the trial was to measure the impact of the school breakfast club project on academic attainment, through the comparison of student outcomes in an intervention group and a control group. Measures of attainment included Key Stage 1 and 2 test scores in English and Mathematics. Randomisation occurred at a school level rather than a student level, to avoid within school disruptions associated with some students receiving breakfast and some not. Schools were randomly allocated to either the intervention group (received support and resources to establish a universal free school breakfast club before school in academic year 2014/2015), or the control group, (received support and resources for the two following academic years 2015/2016 and 2016/2017).

Results showed that breakfast club provision had positive significant effects on Key Stage (KS) 1 test scores in maths, reading, and writing, to the equivalent of two months' progress. However, at KS2, the effects of the school breakfast intervention on attainment were smaller and not statistically significant. Nevertheless, it was noted that 91% of control schools offered largescale breakfast provision to Year 6 pupils during the week of KS2 tests, and therefore this may have affected the results. Self-reports of breakfast consumption from students in intervention and control schools at the start and end of the academic year, showed that the level of breakfast consumption was high at baseline (91%), and breakfast consumption only increased marginally with the intervention. It was therefore suggested that any direct effect of breakfast of school breakfast on attainment might be more likely to be due to changing the content and context of breakfast, as opposed to whether or not breakfast was consumed. For example, at follow-up, more students in the

intervention reported consuming a breakfast containing at least one healthy food, and thus changes appeared to be driven by improvements in the quality of breakfast. Furthermore, data collected on absence and punctuality showed that there were small reductions in late arrivals and school absence following the introduction of school breakfast clubs in the intervention schools. Findings from this study are limited to academic outcomes within one year of the implementation of a school breakfast programme, and the longer-term effects of the school breakfast project on attainment are likely to remain unidentified due to the reported cessation of support from Magic Breakfast to schools in the intervention group.

Finally, a study that used data collected as part of a large-scale cluster randomised controlled trial of the Welsh Government's Primary School Free Breakfast Initiative, was unable to link the breakfast initiative to educational outcomes, as control schools took up the scheme between completion of the trial and collection of educational performance data (Littlecott et al., 2016). Therefore, the study examined longitudinal associations between breakfast consumption the quality of foods children ate for breakfast, and exam results. A secondary analysis investigated whether better educational outcomes were achieved in schools receiving the free school breakfast intervention during the trial period. Children from 111 primary schools, in Years 5 and 6, aged 9-11 years (N = 4,350 at baseline and n = 4,472 at follow-up) completed classroom-based attitude and dietary recall questionnaires. A repeated cross-sectional design was used, sampling children from Year 5 and 6 at baseline and follow-up. A nested cohort of children (n = 1216), who were in Year 5 at baseline (16–18 months prior to collection of educational outcomes data) but Year 6 at follow-up (4–6 months prior to collection of educational outcomes data), provided data at both baseline and follow-up. Dietary data were collected using a modified version of the Day in the Life Questionnaire (Edmunds & Ziebland, 2002). The questionnaire covered a period slightly in excess of 24 hours, with children reporting all foods consumed at chronologically ordered time points throughout the previous day and for breakfast on the day of reporting. Outcome variables included the proportion of children consuming less than two breakfasts; number of healthy items (cereals, bread, fruits and milk products) consumed for breakfast; number of unhealthy items (crisps and sweet snacks) consumed for breakfast; number of fruits and vegetables consumed during the rest of the day; and the number of unhealthy items consumed during the rest of the day. To measure educational outcomes, data on Statutory Assessment Tests (SATs), which are mandatory tests undertaken by children in England and Wales, were obtained from educational databases.

Following the trial, SATs results were linked with children's reports of breakfast consumption. Results showed that breakfast consumption, number of healthy breakfast items consumed, number of sweets and crisps consumed across the rest of the day, and number of fruit and vegetables consumed across the rest of the day, were all significantly and positively associated with educational performance, at both baseline and follow-up, and after adjusting for gender and free school meals entitlement. No associations were observed between the number of unhealthy breakfast items consumed and educational performance. Evidence that educational outcomes were mediated by socioeconomic differences was ruled out, as associations of school and individual measures of socioeconomic status did not change following the inclusion of dietary variables. In addition, amongst the cohort of children who provided data at baseline and follow-up, all dietary measures were associated with educational performance, with the exception of consumption of unhealthy breakfast items, as with the whole group. However, results from the analysis investigating between group differences amongst children in the school breakfast intervention group and the non- school breakfast control groups, showed no significant differences in educational performance, and hence no evidence was provided of an intervention effect on educational outcomes.

Whilst this study provided evidence of an association between dietary behaviours and actual measures of educational attainment, and some support for the notion that improving breakfast consumption may improve academic performance, it does not provide evidence that improving breakfast consumption alone would reduce inequality in educational outcomes. In addition, the study did not ascertain the causal

mechanisms by which breakfast consumption and educational outcomes were linked, and thus how breakfast consumption improves academic outcomes.

School Breakfast Clubs: Behavioural Outcomes

It has also been suggested that breakfast may positively affect learning in terms of its impact on children's behaviour in school. It is supposed that cognitive, behavioural and educational outcomes are intrinsically linked, and therefore changes in cognitive performance, such as attention, may be observed alongside increases in on-task behaviour in the classroom, which concurrently may also impact positively on both short and longer term educational outcomes (Adolphus et al., 2016).

A 2014 YouGov survey, conducted in English schools, estimated that pupils may lose up to an hour of learning each day due to disruption in classrooms. However, limited research exists on the associations between breakfast consumption and non-consumption on children's behaviour in school, and results are mixed. It is considered that the provision of school breakfast, in particular universal free school breakfast, may impact on behaviour in school, as it is supposed that children who are adequately nourished will be more cooperative, attentive, able to complete tasks, and be able to exhibit more control over their behavioural impulses (Bernstein, McLaughlin, Crepinsek, & Daft, 2004).

Studies have reported an increase in positive behaviours during school breakfast (Graham, Russo, & Defeyter, 2015), and increases in on-task behaviour (Bro, Shank, McLaughlin, & Williams, 1996; Richter, Rose, & Griesel, 1997) and reduced hyperactivity (Richter et al., 1997) following school breakfast. However, studies have also reported increases in abnormal and borderline behaviours (Shemilt et al., 2004), and higher occurrences of student disciplinary incidents (Bernstein et al., 2004) following school breakfast. Nevertheless, evident negative impacts of school breakfast on behaviour have been attributed to confounding factors, including poor infrastructure and inadequate supervision within schools (Chang et al., 1996; Shemilt et al., 2004).

Psychosocial and Behavioural Cognitions, and Breakfast

Research indicates that food preferences are formulated as a consequence of an individual's interactions with various environmental factors, including: childhood experiences with food and eating, exposure to food and eating experiences, positive and/or negative conditioning concerning food and eating behaviours, and genetics, i.e. sensitivity to bitter tastes (Story, Neumark-Szainer, & French, 2002). Moreover, food is interconnected with identity and self-concept; relationships with family and friends; and security, independence and authority. Therefore, changing eating behaviours is much more than changing the food itself, it is also about changing norms.

According to social cognitive theories of behaviour, it is considered that health behaviours may be predicted by behavioural intentions, which are in turn predicted in various extents by attitudes, subjective norms and perceived behavioural control (Tapper et al., 2008). Regarding breakfast, it is thus considered that attitudes towards breakfast are likely to contribute to breakfast intentions, and subsequently both attitudes and intentions may predict long-term breakfast behaviour. Research has reported more positive attitudes towards breakfast amongst children who frequently consume breakfast, in addition to more healthy breakfast food choices (Berg, Jonsson, & Conner, 2000; Martens, Van Assema, & Brug, 2016; Moore et al., 2007; Tapper et al., 2008). Likewise, more negative attitudes towards breakfast have been associated with skipping breakfast (Tapper et al., 2008). For example, a study validating a measure of attitudes towards breakfast reported that children who did not skip breakfast demonstrated more positive attitudes towards breakfast, than those who skipped breakfast, and also consumed greater numbers of healthy breakfast items and fewer unhealthy items (Tapper et al., 2008).

In addition, findings from a study, investigating whether children's attitudes towards breakfast mediated the relationship between deprivation and breakfast consumption behaviours, amongst school children (N =

4211; 9-11years) in Wales, indicated that improving children's attitudes may contribute to the improvement of nutritional intake (Moore et al., 2007). The study utilised a cross sectional survey design, gathering data from 111 primary schools. Children's attitudes towards breakfast and dietary data were collected using validated questionnaires including the Breakfast Attitudes (Tapper et al., 2008) and Day in the Life (Tapper et al., 2008). Breakfast items were dichotomised into six food categories, which were collapsed into two variables; 'healthy' and 'unhealthy.' Deprivation was assessed using the percentage of children within each school eligible for free school meals. Results showed that deprivation was positively associated with breakfast skipping and consumption of unhealthy breakfast food items, including sweet items and crisps. Likewise, a significant negative association between deprivation and consumption of healthy breakfast items was also observed, indicating that as deprivation increased, consumption of healthy breakfast items decreased. Concerning attitudes towards breakfast, positive associations were reported with consumption of healthy items including cereals and fruits, and negative associations were reported with breakfast skipping, and consumption of unhealthy items including sweet items and crisps. Further analysis showed that deprivation was significantly positively associated with attitudes towards breakfast; as when deprivation increased, attitudes towards breakfast consumption became increasingly negative. Correspondingly, a significant positive association was reported between attitudes towards breakfast consumption and consumption of healthy breakfast items.

It is supposed that these findings indicate that relationships between deprivation, breakfast skipping, and consumption of unhealthy items may be mediated by children's attitudes towards breakfast. Therefore, it is suggested that interventions to improve children's attitudes towards breakfast consumption may impact on nutritional inequalities. However, as the authors themselves noted, these findings should not undermine the influence of wider social and environmental factors of nutritional inequality and eating behaviours, such as socioeconomic determinants and food availability.

Familial Influences on Breakfast Behaviours

It is considered that the family is a major influence on children's and adolescents' eating behaviours, predominantly due to being the main provider of food, in addition to familial influences on attitudes towards food, food preferences, beliefs and values that affect eating habits throughout the lifespan (Story et al., 2002). It is supposed that health behaviours are socially established in the family, with the beliefs, attitudes and behaviours of parents/carers being an important influence on the health behaviours of children (Pearson, Biddle, & Gorely, 2009).

Research indicates that modelling, reinforcing and instructing of eating habits by parents/carers are central in influencing the dietary behaviours of children and adolescents, and parental eating behaviours have been shown to be positively associated with unhealthy and healthy dietary behaviours amongst young people (Franko, Thompson, Bauserman, Affenito, & Striegel-Moore, 2008; O'Neil et al., 2014; Pearson et al., 2009). It has therefore been suggested that supporting parents and carers to be positive role models with their own dietary behaviours may be beneficial in promoting healthy eating behaviours amongst children (Pearson et al., 2009). A systematic review, investigating family correlates of breakfast consumption amongst children and adolescents, suggested that parental breakfast eating is an important correlate of breakfast consumption amongst children and adolescents (Pearson et al., 2009).

Research has suggested significant associations between parent/carer breakfast consumption behaviours, and the behaviours of their children. For example, a large-scale study, investigating the socioeconomic and behavioural factors associated with breakfast skipping, amongst Finnish adolescent twins (N = 5448) and their parents (N = 4660), indicated that parent breakfast eating was a significant correlate of adolescent breakfast eating (Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003). Survey data were collected from adolescents and parents on breakfast eating habits, including breakfast frequency, health compromising behaviours and socioeconomic status. Breakfast consumption frequency was dichotomised as 'once a week

or less,' 'a few times a week,' and 'every morning.' Results showed that parental breakfast eating was the most significant factor associated with breakfast eating. Children of breakfast skipping parents were far more likely to skip breakfast, compared to children of parents who consumed breakfast habitually. The authors suggest that these findings indicate that breakfast skipping may not be solved by interventions which focus solely on the individual child/adolescent, and thus breakfast endorsing initiatives that address the family and/or parents may be more effective.

In addition to the inferred relationships between children's/adolescents' breakfast behaviours and parental breakfast behaviours, it has also been suggested that associations exist between parental attitudes and beliefs towards breakfast, and children's/adolescents' breakfast behaviours. For instance, a cross sectional study examining impact of children's and adolescents' perceptions of parental attitudes on breakfast skipping, amongst primary aged children (N = 426; 10-14 years) from Hong Kong, reported that breakfast skipping was associated with a lack of perceived parental emphasis on breakfast (Cheng, Tse, Yu, & Griffiths, 2008). Self-report data, obtained via questionnaires completed by children, included reasons for omitting breakfast, factors that would enable the child to consume breakfast regularly, breakfast beliefs, and perceived parental attitudes towards breakfast. Results showed a significant association between lack of perceived parental emphasis on breakfast and breakfast skipping amongst children and adolescents, with those who did not perceive there to be a parental emphasis on breakfast being more likely to omit breakfast.

Peer Influences on Breakfast Behaviours

Conversely, other studies have contested that as children get older they are likely to spend less time in the home and thus be less influenced by parents'/carers' beliefs, attitudes and behaviours, and more so by their peers and factors within the school environment (Pearson et al., 2009). It is suggested that as children become older their autonomy and independence also increase and they become less influenced by parents/carers in their food choices, perhaps eating outside of the home more frequently (Hallström et al., 2011; Story et al., 2002). The influence of peers and conformism to peer group norms is considered to increase as children get older, and it is understood that peers become a significant influence on adolescent behaviour (Story et al., 2002). Typically, older children and adolescents spend a considerable amount of time with their peers, whilst at school and often outside of school, compared to younger children. Moreover, as eating is deemed as a form of socialisation and recreation, it is evident that peer approval and group conformity may be influential in food choice and eating behaviour amongst children and adolescents. With regards to breakfast consumption behaviours, research has shown that peer influence is an important factor in adolescent breakfast consumption (Hallström et al., 2011).

For example, a large scale study examining breakfast habits and factors influencing food choices at breakfast, in relation to socio-demographic and family factors, amongst European adolescents (N = 3528), reported that girls whose peers ate healthily were more likely to be regular breakfast consumers (Hallström et al., 2011). Data were collected using self-report measures, and potential factors influencing breakfast were presented on a scale ranging from 'no influence' to 'very strong influence.' These factors included: personal, i.e. hunger, taste, health, daily routine, ease of preparation, medical reason and price; and socio-environmental, i.e. parents or guardian, availability, friends and school environment. Breakfast consumption was assessed based on agreement with the statement: "I often skip breakfast" with seven answer categories ranging from strongly disagree to strongly agree. Results showed that breakfast consumption amongst girls was associated with the socio-economic factor 'peers' behaviour.' However, it was also reported that parental dietary behaviours and parental encouragement to eat a healthy breakfast were positively associated with breakfast consumption amongst adolescents, especially boys. Nevertheless, it was claimed that younger adolescents were more influenced by their parents in their breakfast food choices, compared to older adolescents, reflecting the suggestion that adolescents' autonomy increases with age (Story et al., 2002). It was suggested that the findings from this study advocate that interventions aiming to influence

older children and adolescent behaviour may be more effective when they work towards creating family and peer environments and norms that endorse health conscious behaviour (see also Bruening et al., 2012).

Furthermore, research into the social benefits of school breakfast has also indicated positive social impacts for school children. Findings from a UK based study, investigating whether attendance at breakfast clubs had an impact on children's friendship quality and experiences of peer victimisation, suggested that attendance at school breakfast club fostered the quality of children's friendships over time (Defeyter, Graham, & Russo, 2015). Data were collected from children (N = 268; 5-10 years) from eight schools, utilising validated measures including the Friendship Qualities Scale and the Multidimensional Peer Victimization Scale. Data were collected at two time points; time 1 being two months after the introduction of school breakfast clubs, and time 2 being 6 months later. Participating children were divided into groups including 'breakfast-club-attendees' (n = 94), 'non-club-attendees' (n = 88) and 'after-school-club-attendee's (n = 86). Results reported that at time 2 breakfast-club-attendees showed improved levels of friendship quality and experienced a decline in peer victimisation over time. Moreover, children attending school breakfast clubs reported increased levels of companionship, closeness, help, and security, and reduced levels of conflict, compared to the after-school group and the no-club group. It was suggested that the findings indicated school breakfast clubs may prevent deteriorations in friendship quality and may lead to improvements in children's dyadic relationships. School breakfast clubs are advocated for providing children with opportunities for unstructured social interactions with small groups of peers, whilst consuming breakfast.

In addition, qualitative studies, into school breakfast clubs and schemes, have also reported positive social impacts on school children. For example, a UK based study, examining the perceptions of a universal free school breakfast programme, amongst parents (n = 17), children (n = 38) and school staff (n = 14), revealed that the scheme had positive influences on children's social relationships (Graham, Russo, Blackledge, & Defeyter, 2014). Findings from semi-structured interviews showed that school breakfast clubs were perceived amongst participants as valuable in encouraging social interactions between children, in providing the opportunity to eat breakfast with peers, and fostering a more positive start to the school day. Additionally, findings from a further qualitative evaluation of school holiday breakfast clubs indicated that breakfast clubs had positive social impacts on children. Interviews with children (n = 17) and adult (n = 18) attendees, and staff (n = 15), suggested that school holiday breakfast clubs fostered a regular routine for children during school holidays, counteracted risk of isolation and sedentary behaviour, maintained current friendships and facilitated new friendships (Defeyter, Graham, & Prince, 2015). However, both studies utilised relatively small sample sizes, and data were not gathered pre and post intervention due to the nature of the research.

Macro-level Influencers on Breakfast: Breakfast Environments, School Food Policy and Socioeconomic Factors

Social ecological theory suggests that the physical environment and community settings influence accessibility and availability of foods. It is considered that the environments and community settings proximal to children and adolescents, including home and school, are influential in affecting their dietary behaviours (Story et al., 2002).

Within the home environment, food consumption and food choices are influenced by availability of food, which in turn is affected by the socioeconomic status of the family, with those on low incomes being more likely to experience food insecurity (Diss & Jarvie, 2016.; Harrop & Palmer, 2002; Child Poverty Action Group, 2012). Moreover, children from families experiencing socioeconomic deprivation are more likely to skip breakfast (Vereecken et al., 2009).

Additionally, school aged children spend a considerable amount of time in school and typically consume a large proportion of their daily energy at school predominantly at lunch times, but in some cases schools

provide snacks, i.e. milk and fruit, and school breakfast and after school clubs. Therefore, it is evident that the school environment may also have a significant impact on children's food choices and eating behaviours.

Furthermore, according to socioecological models, behaviours within these environments are also affected by macro-level influences, such as local and national policies and legislation that regulate and impact on food availability and food related issues (Story et al., 2002).

Home Environment and Socioeconomic Factors

In addition to the proposed correlation between parental breakfast behaviours and beliefs, and the breakfast behaviours of children and adolescents, research has shown that breakfast consumption may also be influenced by family structure and socioeconomic status (Hallström et al., 2011; Sjöberg et al., 2003; Vereecken et al., 2009).

For example, a largescale cross-national study, with European adolescents, found that male adolescents who lived with single parent and shared custody families were more likely to skip breakfast, compared to their peers who lived with both parents (Hallström et al., 2011). Moreover, the study reported that adolescent girls whose mothers held lower levels of educational qualifications were more likely to skip breakfast than girls whose mothers held higher educational qualifications.

Comparable findings have also been reported in other studies, such as in a large-scale study by the World Health Organisation (WHO), with children and adolescents (N = 204,534; 11-15 years) from 41 European and USA countries and regions, which reported that children and adolescents living in single parent families and those from lower socioeconomic families were less likely to habitually consume breakfast (Vereecken et al., 2009).

Similarly, a further large-scale study, with Danish adolescents (N = 3,458; 14-16 years), reported that adolescents whose mothers were unemployed were less likely to consume breakfast every day, whilst adolescents living with both biological parents were found to be more likely to eat breakfast every day (Johansen, Rasmussen, & Madsen, 2006).

It is understandable that the socioeconomic status of a family will affect dietary behaviours amongst children and adolescents, primarily because income largely dictates the amount of money a family can spend on food, thus influencing food consumption and choice. An established social gradient in health currently exists in the UK, with declines in health outcomes and life expectancy the lower an individual's socioeconomic status (Marmot, 2010).

More recent reports from the Child Action Poverty Group revealed that it was common amongst children who were not eligible for free school meals to arrive at school with no money because their parents/carers could not afford to provide it (Diss & Jarvie, 2016). A mixed methods study examining the experiences of food insecure families living in the UK, reported that parents experiencing food insecurity were not able to shield their children from the effects, with most being unable to afford a nutritionally balanced diet for their children, and almost half reporting that their child had gone to bed hungry (Harvey, 2016). In food insecure and impoverished circumstances, it has been suggested that the most commonly omitted meal is breakfast (Potamites, & Gordon, 2010; Rampersaud, 2008).

School Breakfast Provision and School Food Policy

Interventions to improve child health behaviours and outcomes are increasingly delivered through schools, and it is within these contexts that school breakfast schemes and initiatives operate. School breakfast refers to the provision of a breakfast meal for children, usually delivered in schools. The aims of school breakfast clubs, programmes and initiatives are multiple, and may include alleviating hunger, and improving health and nutrition; alongside the provision of a healthy meal, opportunities for social interaction, educational and

physical activities, and out of school childcare. The concept of school breakfast is considered to have originated from a universal free school breakfast programme in Oslo, Norway, during the 1930s (Andresen & Elvbakken, 2007). As opposed to providing large quantities of food at low costs, the scheme was underpinned by nutritional science and aimed to provide children with sufficient quantities of necessary nutrients (Andresen & Elvbakken, 2007). In the USA, a seminal and large scale shift towards school breakfast provision occurred later, during the 1960s, through the introduction of the School Breakfast Programme (SBP) in 1966, which aimed to assist schools in deprived communities by providing federal funding to offer a breakfast meal to nutritionally needy children (Shaw, 1998; Shemilt et al., 2004). By 1997, approximately 68,000 USA schools were serving breakfast to six million children (Shemilt, Harvey, et al., 2004).

Conversely, in the UK, school breakfast provision was a more recent occurrence, in the 1990s, aided by the Government's Department of Health's initiative to support the development of school breakfast provision, and in part an expansion of school based out of hours childcare (Shemilt, Harvey, Robinson, & Camina, 2003). Subsequently, the UK has observed a significant increase in school breakfast programmes and clubs (Harper, Wood, & Mitchell, 2008), with audits indicating that over 85% of schools have some type of breakfast provision (Kellogg's, 2015). To date, there is no sole definition of what constitutes school breakfast provision, as various models exist, and ways in which programmes and clubs may operate depends on the facilities available within the school environment. Where facilities are restricted, basic serving models and limited menus may be available, but schools with the space, facilities and resources may operate larger scale provision serving a wider range of foods that require additional preparation. Moreover, school breakfast may also be served in school halls, canteens, classrooms, and community venues external to the school such as church and community halls. However, regardless of the different types of school breakfast models, schools generally have a duty to adhere to School Food Standards that have been put in place to ensure that the breakfast served to children is nutritious.

Incidentally, reports of children arriving to school hungry have increased, and breakfast skipping continues to have an increased prevalence amongst children and adolescents (Wang et al., 2016). In respect, it has been suggested that, whilst school breakfast provision may have the potential to reduce barriers to breakfast consumption for children, more knowledge is required in order to acquire a better understanding of what drives participation and attendance, and thereby develop more effective interventions (Hoyland et al., 2012). Correspondingly, universal provision of school breakfast has been suggested as a means of addressing barriers to participation and raising attendance. It is considered increased participation via universal provision may reduce inequalities and cumulate in wider impacts on educational outcomes, such as increased alertness and energy from a potentially healthier breakfast, and improved punctuality and attendance (Leos-Urbel et al., 2013; Moore et al., 2014). It is evident school breakfast provision originated as a means of reducing health and social inequalities, through the improvement of the nutritional status for children living within areas of high deprivation. Delivery of school breakfast schemes is often concentrated in areas with high levels of deprivation (Moore et al., 2014), and from a policy perspective, a fundamental factor is the prevention of hunger in children at the start of the school day (Dimbleby & Vincent, 2013).

However, targeting the neediest children is suggested to establish a stigmatisation towards children, families and communities, which acts as a barrier to participation (Leos-Urbel et al., 2013; Moore et al., 2014). Moreover, it has been claimed there may be a greater reluctance amongst children from low income families, in utilising provision, when there is an increased risk of being labelled as 'poor' (Brown, Beardslee, & Prothrow-Stith, 2008). Relatively, USA based research, into school breakfast participation, has identified social stigma as a barrier to attendance, and subsequently reported a 240% increase in attendance, following the replacement of a means tested model for a universally free model (Lent & Emerson, 2007). Targeting particular groups may be perceived as favourable because resources are directed to those who most need them, and it has been implied that universal provision may widen inequality by assisting more affluent

groups (Leos-Urbel et al., 2013; Moore et al., 2014). However, it is contested the reduced costs of targeted provision are negated by increased administrative costs and additional burdens on schools associated with means testing (Leos-Urbel et al., 2013). Universal provision is believed to reduce the administrative burden on schools, in addition to reducing the stigma associated with provision for the 'neediest' (Leos-Urbel et al., 2013). Moreover, motives for the omission of breakfast may be numerous, including poverty and food insecurity, rushed morning routines, fatigue, lack of appetite, and weight control. Therefore, considering the complexity of breakfast skipping behaviours, and the evidence suggesting correlations with detrimental behaviours and outcomes (Currie et al., 2012; Elgar et al., 2005; Huang, Hu, Fan, Liao, & Tsai, 2010; Revicki et al., 1991), targeted breakfast provision for the most 'needy' children using measures of socioeconomic status, such as free school meals, may neglect to reach a demographic of children who are skipping breakfast, and perhaps not in receipt of free school meals.

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