


Evidence for environmental
interventions to prevent childhood
overweight and obesity within schools

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1 About this briefing

This briefing paper aims to provide an overview of the best available evidence on the effectiveness of food environment interventions to prevent childhood overweight and obesity in school settings. The first section looks at the context of childhood obesity in Scotland and the role of the obesogenic environment.* The second section sets out the systematic review level evidence on food environment interventions within the micro environment of the school. The evidence is categorised into four environmental characteristics: political, physical, economic and socio-cultural. The final section provides conclusions from the available evidence and limitations of the review.

1.1 Key points:

- The evidence supports the work taken forward in Scotland as part of the Schools (Health Promotion and Nutrition) (Scotland) Act 2007.
- Food and drink policies within schools are most effective when they are comprehensive, addressing the whole food environment within schools.
- Adaptations to the food provided in schools such as reducing fat content, providing age-appropriate portion sizes and limiting unhealthy options have the potential to influence children and young people's consumption patterns and reduce prevalence of overweight and obesity in schools.
- Nutritional information appears to have an effect on food choices for children and young people in schools, but minimal effect on calorie intake.
- Increasing the prices of unhealthy products and decreasing the prices of healthy products has the potential to influence the purchasing/consumption behaviour of children and young people.
- Actions to improve the aesthetics of school dining areas and encourage positive social interactions may encourage pupils to eat within school, therefore reducing exposure to high fat, sugar and salt foods provided outside the school gates.

* Obesogenic environments impede an individual's ability to choose actions which would have a positive impact on maintaining a healthy weight or to lose excess weight, such as access to and availability of healthy foods and time to undertake physical activity.

- Combining environmental interventions with educational interventions enhances impact on maintaining healthy weight and helps to maintain this effect in the longer term.
- Environmental interventions should be taken as part of a collection of actions to make a meaningful impact on overweight and obesity in children and young people.

1.2 Background

The prevalence of childhood obesity in Scotland has remained stubbornly high. In 2015 28% of children aged 2–15 years were at risk of being overweight (including obese), and 14.5% of children were at risk of obesity.¹ The gap between levels of children at risk of obesity and overweight in the most and least deprived areas is growing.² This area of growing inequality is caused by slightly declining levels in children from the least deprived areas and steadily rising levels in children from the most deprived areas.

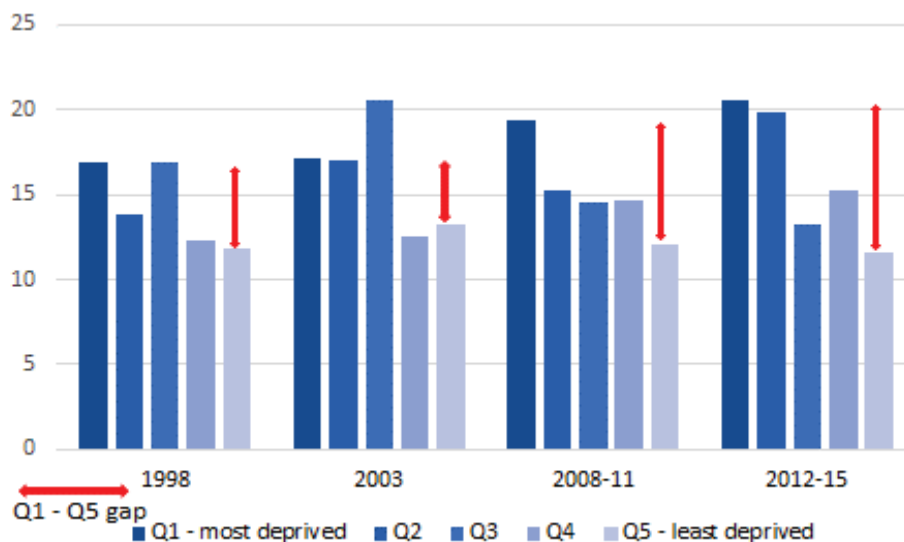


Chart: Obesity risk in children aged 2–15 years by SIMD quintile, 1998 to 2012–15. Source: Scottish Health Survey³

Overweight and obesity in childhood is associated with poorer health and economic outcomes⁴ which occur both in the short term and long term. For example there are

associations between obesity and lower educational attainment⁵, which is likely to be a result of complex relationships between obesity, experiences of poverty and stigma. Overweight and obesity in childhood is associated with a greater risk of being overweight or obese in adulthood⁶, resulting in poorer long-term health outcomes. Obesity can contribute to a number of physical and mental illnesses and is associated with premature death. In addition, it is associated with poorer employment outcomes, such as lower wages, early exit from the workplace through sickness or early retirement.^{7 8} In the UK in 2014 it was estimated that there were approximately ten thousand benefit claimants for whom obesity was their main disabling condition.⁹

Overweight and obesity occur when there is an imbalance of energy intake and energy expenditure. It is now generally agreed that the recent rapid rise in obesity in the population is in the most part a result of increased energy intake, due to the easy availability of cheap energy-dense foods.¹⁰ The causes of this imbalance are complex and multifaceted, including biological, psychological and behavioural factors. These are all set within a cultural, environmental and social framework that encourages consuming more and moving less.^{11 12}

In order to tackle the childhood overweight and obesity epidemic, preventative interventions have mainly focused on improving the individual behaviours which are associated with weight gain, such as education on healthy eating and interventions to increase physical activity. However, given the impact of environmental factors on overweight and obesity, these interventions have mixed success, often with only short-term effects. Therefore addressing an individual's behaviour alone will not address the problem. Alongside action to support individual knowledge and skills, action is necessary to change systems and environments in which people live to enable changes to be both made and maintained.^{4 13 14 15}

1.3 The obesogenic environment

As mentioned above the causes of obesity are multifaceted and embedded into the environments in which people live. It is widely recognised that action must be taken

across an array of different areas in order to make the impact needed to improve population outcomes.¹⁰

The current environment has developed in a way which makes it easier for people to consume more food that is higher in fat and sugar and to be less physically active¹⁶, defined by Swinburn as the obesogenic environment: 'The sum of the influences that the surroundings, opportunities or conditions of life have on promoting obesity in individuals and populations'.¹⁷

1.4 The school environment

One microenvironment which is particularly significant to children and young people is the school environment. Other than home, school is the environment in which children and young people spend the greatest part of their time, and therefore has an important role to play in terms of obesity prevention.

Environmental cues within a school, such as how food is presented and served, as well as nutritional standards for schools, shape social norms influencing children and young people's food and activity choices.¹⁸ Interventions which make changes to the school environment can influence behaviour¹⁹, through reducing obesogenic risk factors, making healthy eating choices the easiest choice and by creating a supportive environment that enables children and young people to maintain change.

In Scotland, since 2007, the Schools (Health and Nutrition) (Scotland) Act²⁰ has set nutritional requirements for food and drink in schools. The Act requires schools to ensure that all food and drink provided in schools complies with the nutritional requirements specified. The Act recognises the school environment as an opportunity to promote health, and provides guidelines supported through legislation to ensure a comprehensive approach to the provision of foods and drinks which promote health throughout Scotland's schools.

2 Evidence summary

The following provides a summary of systematic review-level evidence. The review focused on interventions in the food environment within schools and was limited to English language.

2.1 Political environment

The political environment sets out the policies, rules and regulations which relate to food within the school setting. These impact on the actions of staff and pupils within a school.¹⁴

2.1.1 School food and drink policies

There is limited evidence from one moderate-quality systematic review covering school food and drinks policies which supports the importance of controlling the school food environment and suggests an impact on children's weight status.

This evidence suggests that the more comprehensive the food and drink policy is – for example including vending machines and other competitive food sources such as snack bars, prohibiting sugar sweetened beverages (SSBs) and portion size standards – the greater the positive impact. In schools with comprehensive policies, children's BMI increases were lower than in schools without.²¹

Without a comprehensive policy, compensatory behaviour can adversely affect the intended impact of a food and drink policy. For example, a policy which removed crisps, sweets and SSBs from the school canteen but not from vending machines saw the numbers of vending machines in the school double with an 83% increase in vending-machine sales of SSBs.²¹

2.2 Physical environment

The physical environment refers to the types and volume of foods available within schools. This is often determined by school policy and national legislation.

2.2.1 Availability of foods

There is evidence from two systematic reviews which suggests reducing the fat content within meals, decreasing portion sizes and limiting the number of unhealthy options available can lead to decreases in the intake of total calories and increases in the selection of low-fat options.^{21 22}

One review found that increased access to healthier food reduced consumption of SSBs. The same review also found that increased access to unhealthy foods negatively impacted on fruit consumption.¹⁸ However, interventions that targeted single food groups rather than aiming to improve overall access to healthier food did not seem to impact on the consumption of food groups beyond the one targeted. For example, in the UK a school daily fruit scheme showed a modest increase in pupils' fruit consumption but no differences in vegetable, fat or sugar consumption after 12 months.²²

As a whole this evidence would suggest that whole-school approaches would be more effective in preventing overweight and obesity in schools than interventions which only affect one area of the school food provision.

2.2.2 Portion sizes

The over-consumption of calories is a key factor in the development of overweight and obesity. A systematic review, of moderate quality, suggested portion size at lunchtime influenced the volume of food consumed by 5-year-olds, and doubling the volume of food served increased consumption by 25%.²² Another systematic review found evidence of an association between the size of the plate or bowls used and the volume of food served¹⁹, with the bigger the plate or bowl provided the larger volume of food purchased. The evidence suggests that age-appropriate portion sizes or smaller crockery sizes may be effective in reducing over-consumption within school canteens.

2.2.3 Water availability

Evidence from one systematic review has found the provision of water fountains in schools to be associated with a decrease in the prevalence of overweight and obesity. An intervention in the UK found a decrease in the percentage of overweight and obesity of 0.2% compared to an increase of 7.5% in the control group at 12 months follow-up.²² A weaker review found no significant effect on prevalence of obesity, however a significant intervention effect was observed on prevalence of overweight, although this was only observed among non-immigrant children.²³

2.2.4 Nutritional information and product displays

Moderate-quality evidence from two systematic reviews suggests nutritional information at point of purchase within schools is associated with healthier choices by children.²² One study demonstrated a small reduction of 12 kcal per pupil from the response to micronutrient labels²¹, which is unlikely on its own to have a marked effect on weight status. However, the review also concluded the type of labelling used seems to be significant. Systems such as 'pyramid' diagrams, depicting energy content, showed increases in healthier choices. However systems such as 'star' systems, indicating whether a product complied with a nutritional guideline, showed no effect.²¹

How food is presented can also influence food choices. Although with an older age group than the scope of this paper, a systematic review containing a study featuring college students suggested an association between levels of consumption and the variety of food displayed. The study involved jelly beans displayed with all the flavours mixed and then all the flavours separated. Despite there being the same number of flavours, the students' perception of variety increased. The students' perception of the variety on offer was as influential on consumption volume as actual increases in variety. With the greater the variety, perceived or otherwise, the higher the consumption.¹⁹ This suggests an effect which could be explored through further research with school-aged pupils.

2.2.5 Aesthetics of school dining areas

Aesthetics of school dining areas can impact on children and young people's choices on whether they choose to eat within the school dining area, eating packed lunches or outside the school gates. One qualitative study in Scotland highlighted pupils' frustrations regarding aesthetically unappealing environments, for example cheap moulded chairs and no natural light, as reasons for not taking up school meals or choosing to buy food outwith the school.²⁴ However the evidence on effective interventions to adapt the dining environment is not clear, with two intervention trials which enabled pupils to advocate for changes in school catering environments reporting no benefits to diet.²⁵

2.2.6 On-site food production and teaching kitchens

A systematic review which studied school gardening programmes in primary schools found significant improvements in psychosocial outcomes, for example a willingness to try or preferences for vegetables, although these did not translate to the same level of change in dietary behaviour outcomes.¹⁸

2.3 Economic environment

The economic environment within a school's food environment describes the cost to children and young people of purchasing both healthy and unhealthy foods.

In recognition that price can present a significant barrier to accessing healthy food, in Scotland there is universal provision of school meals for children in primary one to primary three. Following these first three years of primary school, the free school meal is means tested. Although substantive evidence on the effectiveness of free school meals has not been found for this review, it is highly plausible that universal free school meals could have a positive impact on child nutrition if the quality of the food is adequate. A study in the UK found that the proportional uptake of free school meals among the eligible population increases as the number of pupils eligible for free school meals within the school population increased.²⁶ This suggests that the

more normalised free school meal provision is, the greater the impact on increasing access to healthy meals.

There is a body of systematic review-level evidence, largely based on modelling studies, on the effect of price on consumption levels in the general population, which suggests that higher prices of discretionary products have a negative effect on consumption²⁷, and these effects are particularly found among certain groups, including young people²⁸. Although not specifically within a school setting it is reasonable to suppose that price increases of discretionary products within the school environment may have similar effects on reducing consumption.

Similarly a large body of systematic review-level evidence has suggested that a reduction in the price of healthy products can increase consumption of healthier products such as fruit and vegetables.²⁷ One high-quality review looking at vending machines within schools suggests signage had no effect on sales. However reducing the price of healthy products by 25% and 50% increased sales by 39% and 93% respectively.

This evidence taken together suggests that price adjustments which increase the cost of certain less healthy products and which reduce the cost of healthier products may be most effective.

2.4 Socio-cultural environment

The socio-cultural environment sets out the attitudes, beliefs and values within a setting which impact on food and drink choices. Again, these can be heavily influenced by policies and legislation that can set the value of good nutrition into multiple aspects of the school day. They are also influenced by less tangible factors such as the interactions between staff and pupils and staff serving as role models. The socio-cultural environment can influence pupils' choices about eating school lunches, packed lunches or outside of the school gates. One review including a qualitative study in Scotland highlighted frustrations regarding rules, such as set

dining times for each year group or separate areas for hot and cold food, which prevented eating with friends, as reasons for not taking up school meals.²⁴ In addition, multiple studies in the same review cited the staffing of school dining rooms as influencing experiences: pupils reported not feeling comfortable and many high-school pupils chose to leave the school grounds to purchase food.²⁴ This can have a significant impact on the food choices they are exposed to.

The evidence identified on the impact of the proximity of fast food outlets to children's weight status was mixed. One systematic review of moderate quality suggested the availability of fast food outlets around a child's school was positively associated with BMI and the proportion of overweight and obese pupils.²⁹ Three low-quality systematic reviews across the whole children's population found no association between BMI and the fast food environment, but direct associations were found between obesity in children from lower-income groups and fast food availability.^{16 30 31} This suggests an inequality of impact between higher and lower income population groups. Although not explored in the reviews it could be hypothesised that this may be due to the cost of fast food providing a cheap alternative than healthier choices for children with limited financial resources.

2.5 Multiple component interventions

Changes to the food environment appear to be effective in improving dietary intake independently of any educational activities.²¹ However, systematic review-level evidence suggests the most significant improvements result from combining educational and environmental components.^{32 33 34}

Findings from a Cochrane review of moderate-quality evidence suggests the most promising policies and strategies to create a comprehensive obesity prevention strategy within schools should include:

- a curriculum which includes healthy eating, physical activity and body image
- multiple sessions for physical activity over each week

- improvements to nutritional value of food served and available within school
- creation of environments and cultural practices that support healthier eating choices and physical activity
- teaching and other staff enabled to incorporate healthier activities and messages throughout the day
- engagement of parents and support to implement changes in home environment.³⁵

In schools, including an environmental component to an obesity prevention programme such as modifying school meals often increased the effect size. Evidence from systematic reviews also suggests this increased impact is sustained over time. One review including multicomponent interventions found smaller increases in BMI compared to control at 10 years.³² Another that included an intervention which reduced fat in school dinners by 30% showed a decrease in school lunch energy from fat by 2.5%, which was sustained at three year follow-up.³⁶ However, some reviews only found sustained results in the female population.³²

These findings suggest that environmental interventions to improve the food environment within schools, as a component of an obesity prevention policy, can help prevent weight gain and help some participants maintain changes they have made in the longer term.

2.6 Health inequalities

Health inequalities are unfair and avoidable differences in people's health across social groups and between different population groups. Health inequalities happen by gender, income, social class, deprivation, educational status, ethnicity and geography.³⁷ This review did not find any specific information about how these environmental interventions might work in different population groups.

We know from theory and a growing body of evidence that universal interventions that change an element of people's living and working condition, such as restrictions

of marketing of unhealthy food, are more likely to be equally or more effective among disadvantaged groups. On the other hand, universal interventions that aim to increase individual knowledge or skills only, such as healthy eating campaigns, may in fact increase inequalities³⁸, unless they are specifically targeted at disadvantaged groups or applied with a scale and intensity in proportion to the level of disadvantage.³⁹

In this review, therefore, we consider that school food environment interventions are likely to be equally or more effective among disadvantaged groups. However, interventions which focus only on education are less likely to be as effective in disadvantaged groups, which will widen inequalities if applied universally.*

* Please note that this statement takes into account the current understanding about health inequalities and how they might be tackled, rather than direct evidence found in this review.

3 Conclusion

The limitations of the review are that although there is a large volume of systematic review level evidence on environmental school-based obesity prevention interventions, within this high quality evidence is limited. The review summarises evidence from international systematic reviews and therefore the reviewer has highlighted the evidence from the UK and Scotland where available. The quality of the evidence should be taken into consideration when considering this as a basis for action.

However, the findings from the available evidence are relatively consistent. Overall, environmental interventions within schools can be effective in preventing and reducing childhood overweight and obesity as part of a collection of actions. The evidence found supports the principles set out in the Schools (Health and Nutrition) (Scotland) Act 2007 and suggest the importance of its contribution to reducing the obesogenic environment alongside improving children and young people's diets.

The more comprehensive food and drink policies within schools are, the more likely there is to be a positive impact in reducing prevalence of overweight and obesity in children. Interventions which reduce the portion sizes offered, or the crockery size in self-service sections, can help reduce the volume of food consumed. Increasing the number of healthier options and reducing the number of unhealthy options to increase healthy choices also has an effect.

Nutritional information appears to have an effect on the food choices of children and young people, but minimal effect on calorie intake. In addition the type of information conveyed in the labels seems to impact on effectiveness, therefore further research would be beneficial in this area especially around children's understanding of nutritional labels.

The evidence would suggest that children and young people's purchasing habits are particularly price sensitive suggesting an opportunity to influence purchasing and

consumption patterns in schools through increasing the prices of unhealthy products and reducing the prices of healthy products.

Areas outwith the Schools (Health and Nutrition) (Scotland) Act, such as outside the school gates and the content of packed lunches, have potential to reduce the positive impact of the Act. This could be mitigated through adapting the environment to encourage pupils to eat in school in dining rooms which meet the Scottish Schools Nutritional Standards. Actions such as making canteen areas more attractive to spend time in and reducing rules which prevent pupils eating with friends, may encourage this. In addition there is a role for planning to influence the volume of unhealthy food outlets around schools.

Combining environmental interventions with educational interventions will enhance the impact on reducing the prevalence of overweight and obesity in children and help maintain this effect in the longer term. Therefore these actions should be considered as part of a combination of interventions within a school.

It should be recognised, however, that school is just one of the environments in which children and young people live and interact. There is therefore a limit to what changing aspects of the school environment can do without wider environmental changes.

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