

School neighbourhood food environments

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Why Schools?

- ✦ Opportunity
- ✦ Equity
- ✦ Education
- ✦ Environment
- ✦ Responsibility

Schools are appealing places to intervene to promote general health and wellbeing among children...

The vast majority of children in the UK attend school on half the days in the year, giving us an excellent opportunity to reach them.

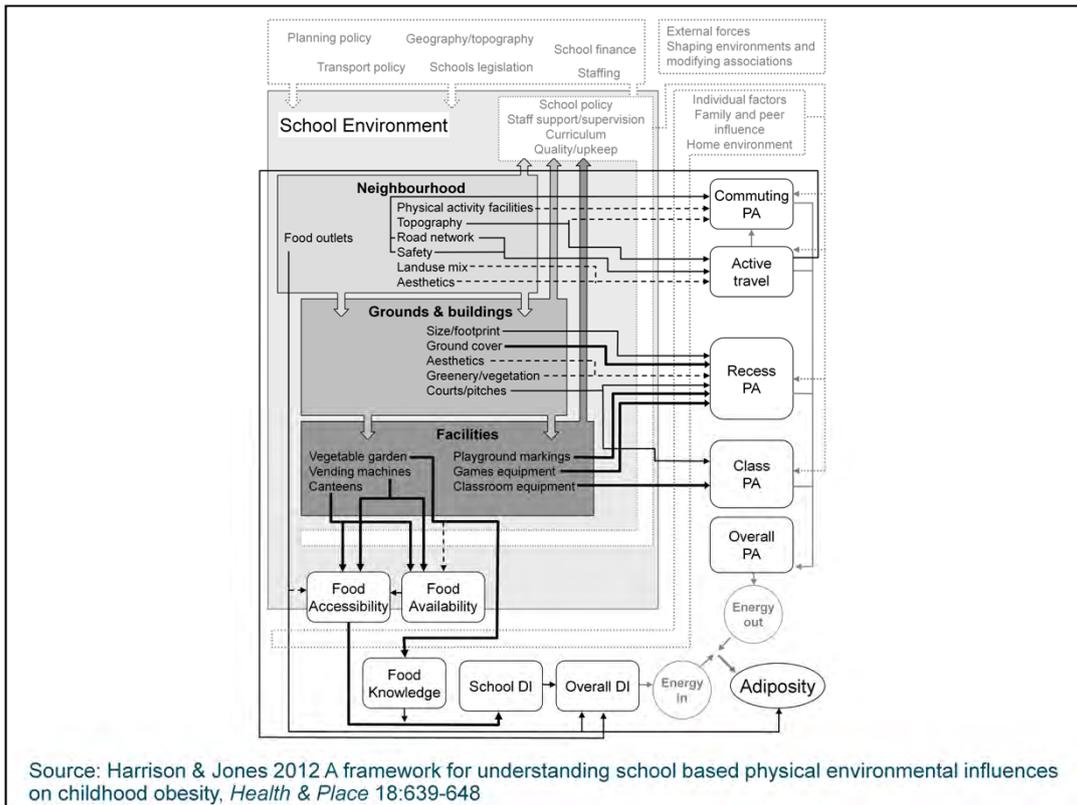
Given that we can reach so many children through schools, this setting may allow more equitable health promotion, connecting with people who are harder to reach through family and community engagement.

Schools are clearly designed to educate, and so health promotion work may be incorporated into the existing curriculum.

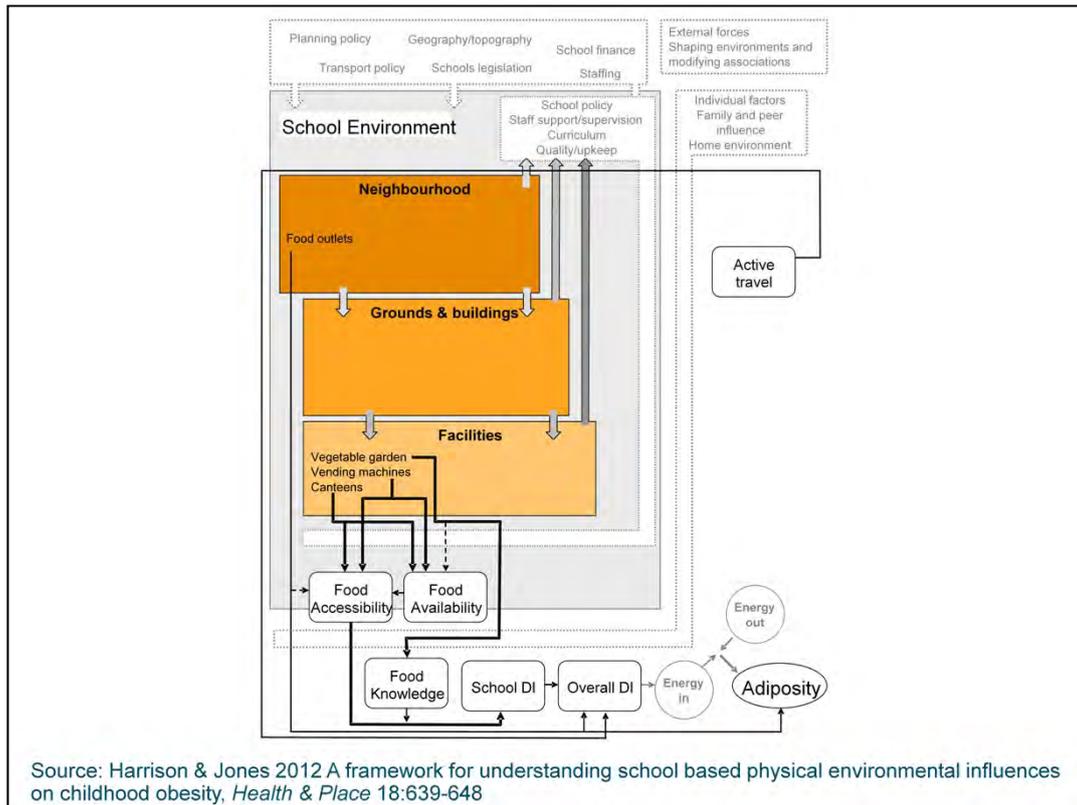
In addition to education schools provide their pupils with an environment which may be modified to promote physical activity or a healthy diet.

And finally, responsibility - schools are the responsibility of the state/local government, so it could be argued that we have a duty to make them healthy places.

So schools are appealing places, but how do they actually influence children's behaviour and health outcomes. I'm interested in diet and physical activity, and how a school's physical environment can impact these behaviours...



This is a framework I've published describing the evidence for how the physical environment of a school is related to obesity, diet and physical activity. It's pretty complicated, and given that today we are specifically interested in food environments, we can focus on the energy-in side of the diagram....



The main things that I'd like to highlight in this diagram, is the different elements of the school environment. This model only considers the physical environment, which I've divided into the facilities available in a school, so for the food environment this would include canteens, vending machines and vegetable gardens, this obviously sits within a school's buildings and grounds – which is a bit of a gap in terms of the food environment. And then the school and its grounds sits within a wider neighbourhood, which will include numerous and different food outlets. Today I am going to focus on this school neighbourhood, and the evidence that exists for how it impacts children's diets and weight status.



This is particularly timely given that in the last month we've seen two reports published recommending the restrictions of the siting of fast food restaurants near to schools, 2020health's careless eating costs lives, and Better Health for London. But what evidence exists for such a policy?

School neighbourhood food environment

Evidence sources

- ✦ **Seeing the school as an important part of a child's world, and therefore as a component of their environment**
- ✦ **For a school, seeing its neighbourhood as an extension of its sphere of influence**

So we believe that the neighbourhood around a school provides access to a range of foodstuffs, and may therefore influence diet and ultimately weight status. Research on the school neighbourhood has really come from two different directions.

The first approach sees the school as part of a child's world and therefore as a component of their total environment.

The second starts with the school, and extends into the neighbourhood, or school fringe in order to understand the school's influence.

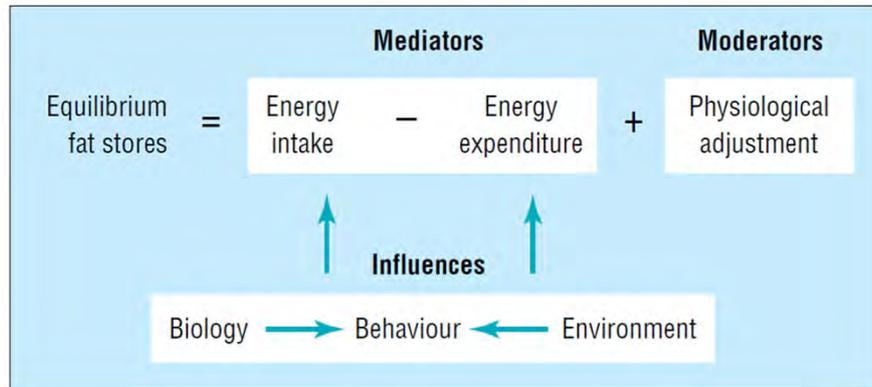
In the first instance we become more interested in understanding total exposure to a given characteristic; food outlets generally, fast-food outlets etc, and we try to quantify this and relate it to a specific health outcome (obesity) or behaviour (consumption of unhealthy foods). Definitions of the school env may be quite crude, but data from large numbers of schools can be analysed in a consistent manner. Looking at total diet or an obesity outcome takes into account the fact that the school env is only contributing to total environmental exposure, and that other places, and other exposure mechanisms are important.

In the second instance, the more specific needs of individual schools or local authorities prevail; an understanding of where children go at lunchtime, what they eat and how this sits with work being done within the school grounds. The focus tends to be very much on lunchtimes – when children are the responsibility of the school, but also on the arrival and departure from school. Using this approach it is harder to look at total diet/health outcomes, or

investigate at large numbers of schools/pupils.

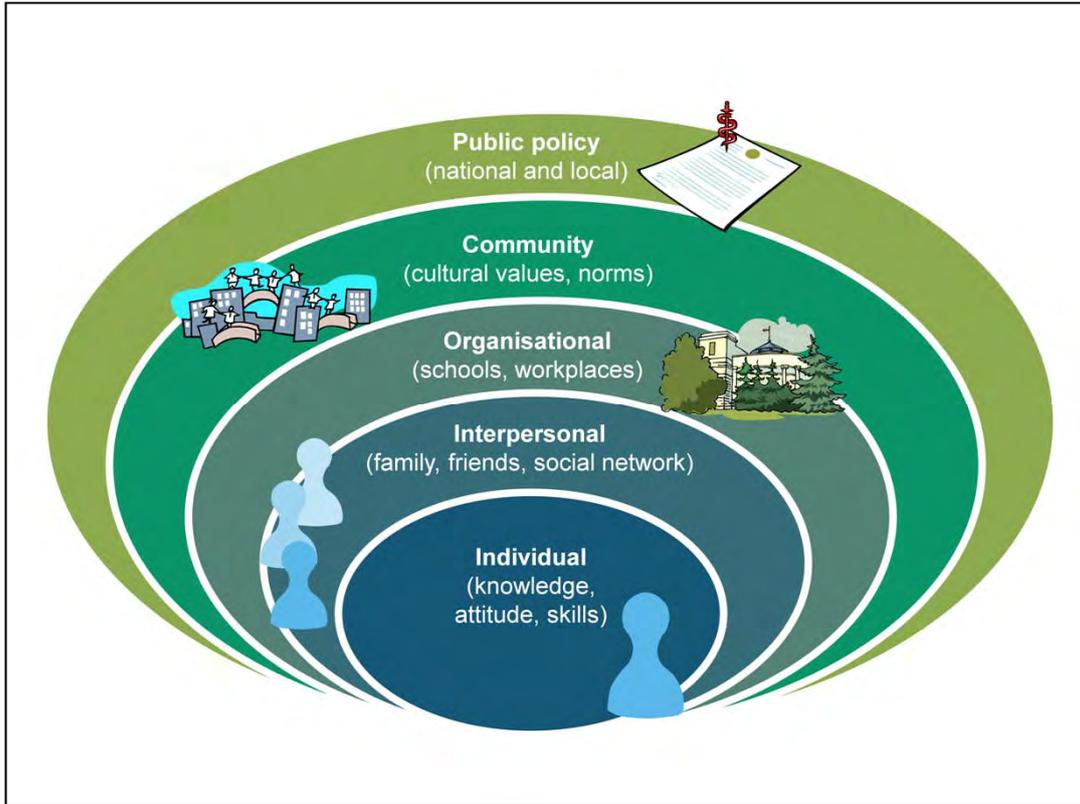
I'm now going to spend some time describing what we've found through these two approaches....

The ecological approach to obesity

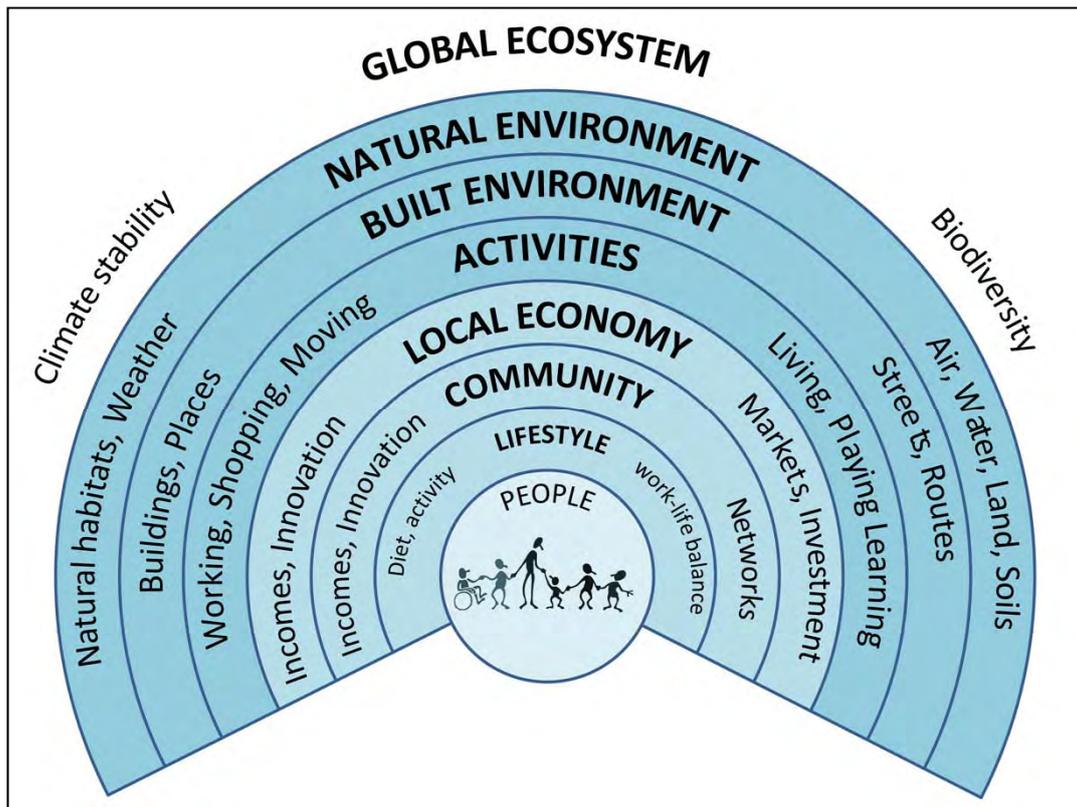


Source: Egger & Swinburn 1997 An "ecological" approach to the obesity pandemic, *BMJ* 315:477-480

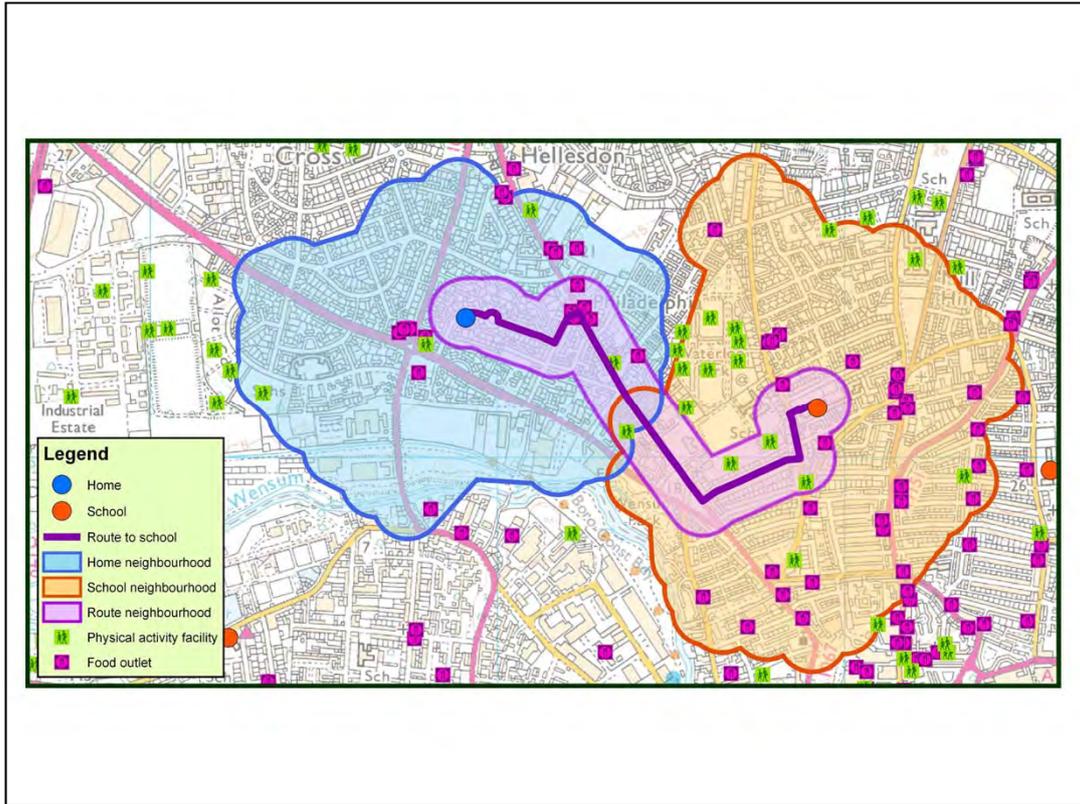
The first line of research really stems from the idea of the obesogenic environment. This concept was proposed in the 1990s and it suggests that obesity is a normal response to an abnormal environment. This is the basic model Eggers and Swiburn propose, whereby the behaviours that regulate energy expenditure and energy intake (namely diet and physical activity) are influenced by both individual biology, and the environment. These ideas sit nicely within the established socio-ecological model of health, which further describes the levels of environmental influence....



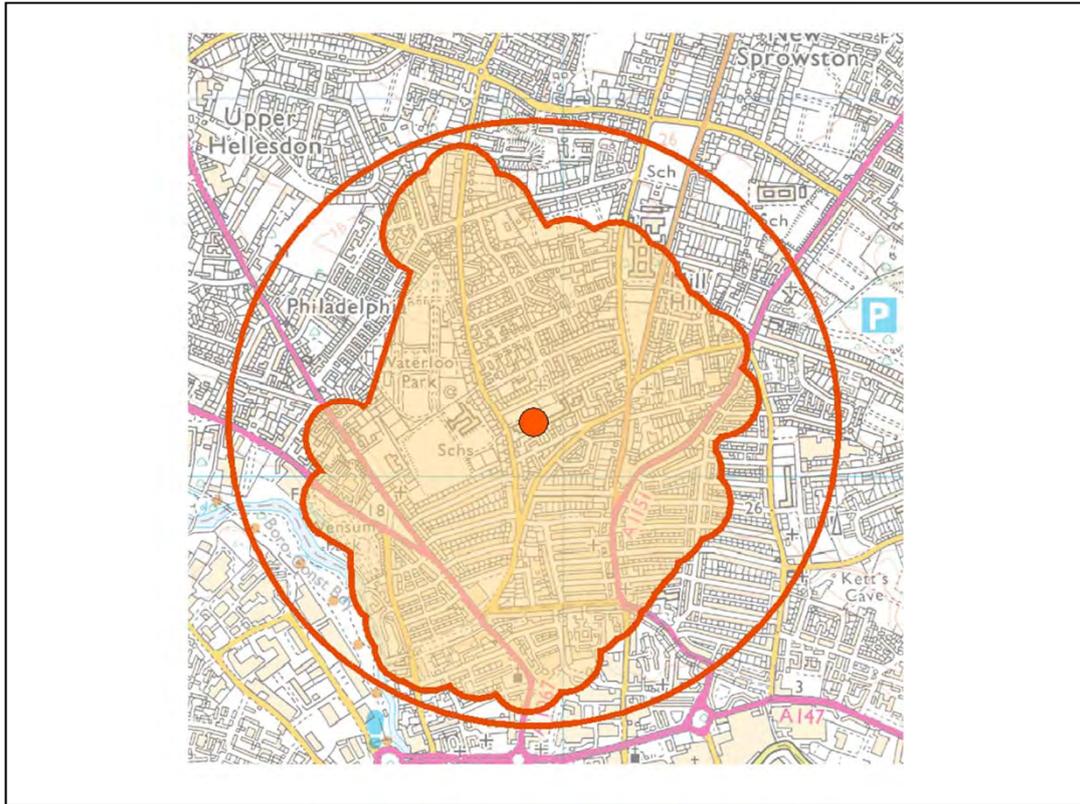
Here the environment operates on many levels from interpersonal social networks, out through organisations including schools to communities and public policies... This idea of multiple levels of influence is also captured in...



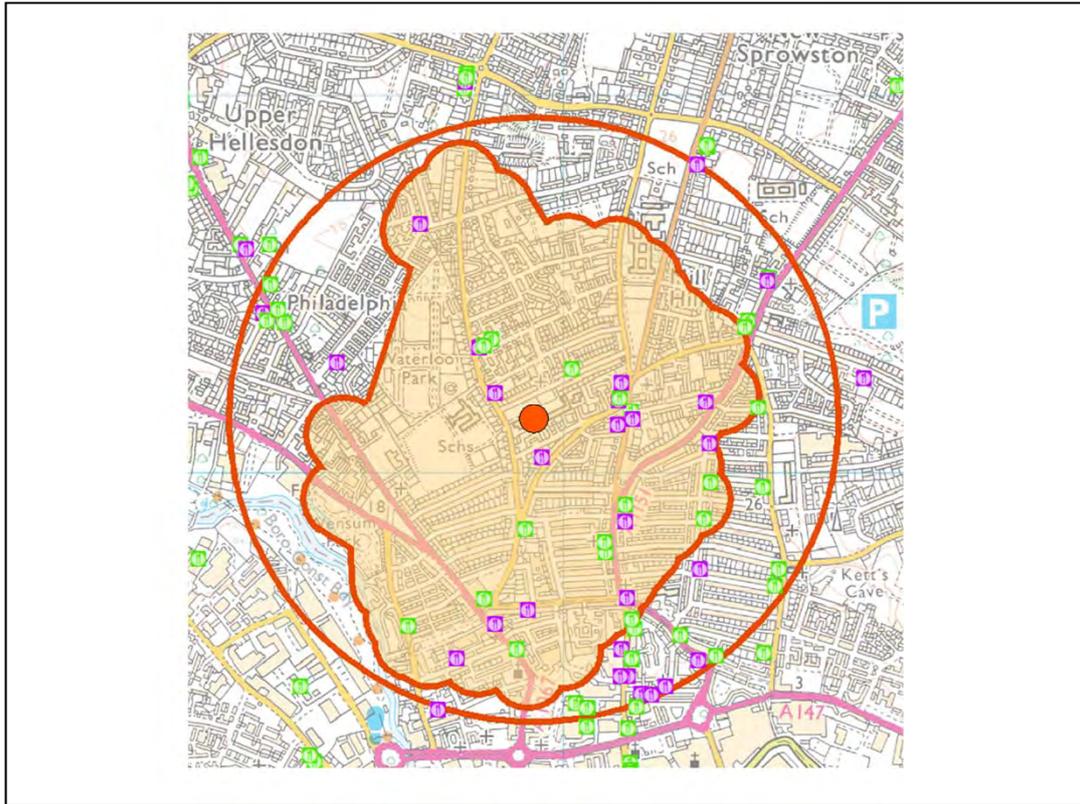
... this model of the determinants of health and wellbeing in neighbourhoods. Here the built environment layer includes buildings, such as schools and shops, and for an individual child will include their home, school and the spaces between these locations. Taking this type of model as a starting point we can start to create a model of a child's environment...



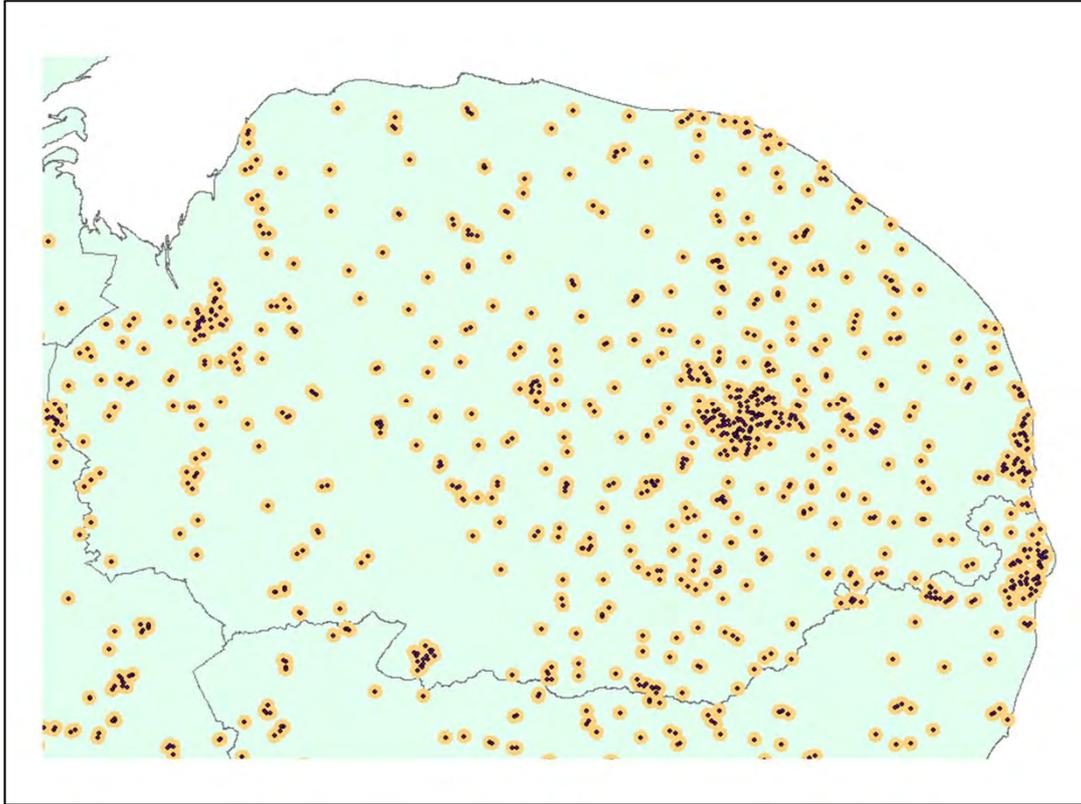
In this example, we can look at a child's, home, school and the route between them, and then start to characterise them. The home neighbourhood was the initial research focus, but this has expanded to look at schools as well. A typical analysis will go something like this....



The school location is identified, and a neighbourhood defined around it – this is typically either a straightline buffer as with this outer circle, or a network buffer which describes the area actually accessible via the street network. The distance used to define this area varies between studies, but 800m, a 10 minute walk is a typical distance.



Once this area is defined, it can be characterised. This characterisation can take different forms – we could look at the location of one type of food outlets – fast-food restaurants or convenience stores, or we could group outlets into healthy and unhealthy groups (as in this map). This can be done via a ground audit, but would typically be done using secondary data sources, making it possible to quickly characterise the neighbourhoods of schools across a large area...



For example across Norfolk as shown here. The characteristics of these schools can then be related to the behaviours of the pupils attending them...

Outcome measures



... and the outcome measures typically used include Food purchases , Diet – total, or reported intake of specific food types, or anthropometric measurements – often BMI.

But what do these studies show?

School neighbourhoods and diet Evidence

obesity reviews

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Public Health

A systematic review of the influence of the retail food environment around schools on obesity-related outcomes

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Summary

The high prevalence of childhood obesity has led to questions about the influence of 'obesogenic' environments on children's health. Public health interventions targeting the retail food environment around schools have been proposed, but it is unclear if they are evidence based. This systematic review investigates associations between food outlets near schools and children's food purchases, consumption and body weight. We conducted a keyword search in 10 databases. Inclusion criteria required papers to be peer reviewed, to measure retailing around schools and to measure obesity-related outcomes among schoolchildren. Thirty papers were included. This review found very little evidence for an effect of the retail food environment surrounding schools on food purchases and consumption, but some evidence of an effect on body weight. Given the general lack of evidence for association with the mediating variables of food purchases and consumption, and the observational nature of the included studies, it is possible that the effect on body weight is a result of residual confounding. Most of the included studies did not consider individual children's journeys through the food environment, suggesting that predominant exposure measures may not account for what individual children actually experience. These findings suggest that future interventions targeting the food environment around schools need careful evaluation.

A useful systematic review of the evidence came out earlier this year. They reviewed the evidence available from studies using the basic methodology just outlined, and found...

School neighbourhoods and diet

Evidence

- ✦ Some evidence of an association between food outlet availability and body weight
- ✦ Limited and inconsistent associations between food outlets and food purchases and consumption

Of the twenty studies they included that had an anthropometric outcome, 14 showed some statistically significant associations in the direction expected – so, for example higher densities of fast food outlets and convenience stores being associated with increased odds of being obese. But, 2 papers showed significant associations in the opposite direction (e.g. lower odds of overweight in schools with more unhealthy food outlets nearby, and 4 showed no significant associations at all.

For food consumption and purchasing the picture was even less clear – of the 11 papers that looked at these outcomes, only 2 showed statistically significant associations.

These results do not provide strong evidence for the benefits of control of the school neighbourhood food environment.

School neighbourhoods and diet: Limitations

- ✦ Study design – mostly cross-sectional
- ✦ Accuracy of food outlet data
- ✦ Reporting error in dietary assessments
- ✦ Are our models sufficient?

So why is the evidence so weak? There are a number of limitations

Most of the studies in this area use a cross-sectional design, which means causality can not be determined, and that residual confounding by individual characteristics is hard to control for. Longitudinal study designs, following the same children up as their environments change would be a stronger design.

These studies mostly rely on secondary data sources for the location of food outlets – these maybe incomplete, out-of-date or lead to the mis-classification of outlets. Similarly there are known issues with the accuracy of diet measures such as the food frequency questionnaires commonly used.

But possibly the biggest issue is the basic model we are using...

Conceptualising school neighbourhood exposure



Is the model too crude? How do we actually theorise what people are exposed to the school neighbourhood food environment?

If we go back to my original example, we've got a school, with an 800m walking buffer – the area which can be reached in a 10minute walk.

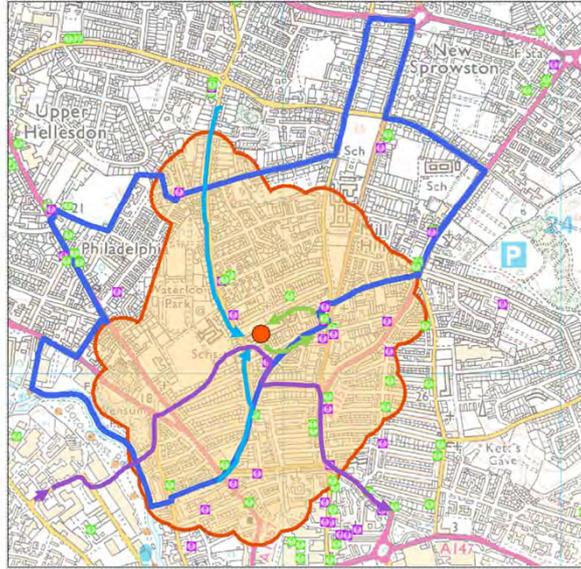
We know children will have to travel through this zone to get to and from the school (blue arrows)

And, if they are allowed to leave the school premises they can use this area in their lunch breaks (green arrows)

But it's not just the children who use this area, schools become a 'node' in parents environments – nearby shops could be used for household shopping on the school run. (purple arrow)

And...

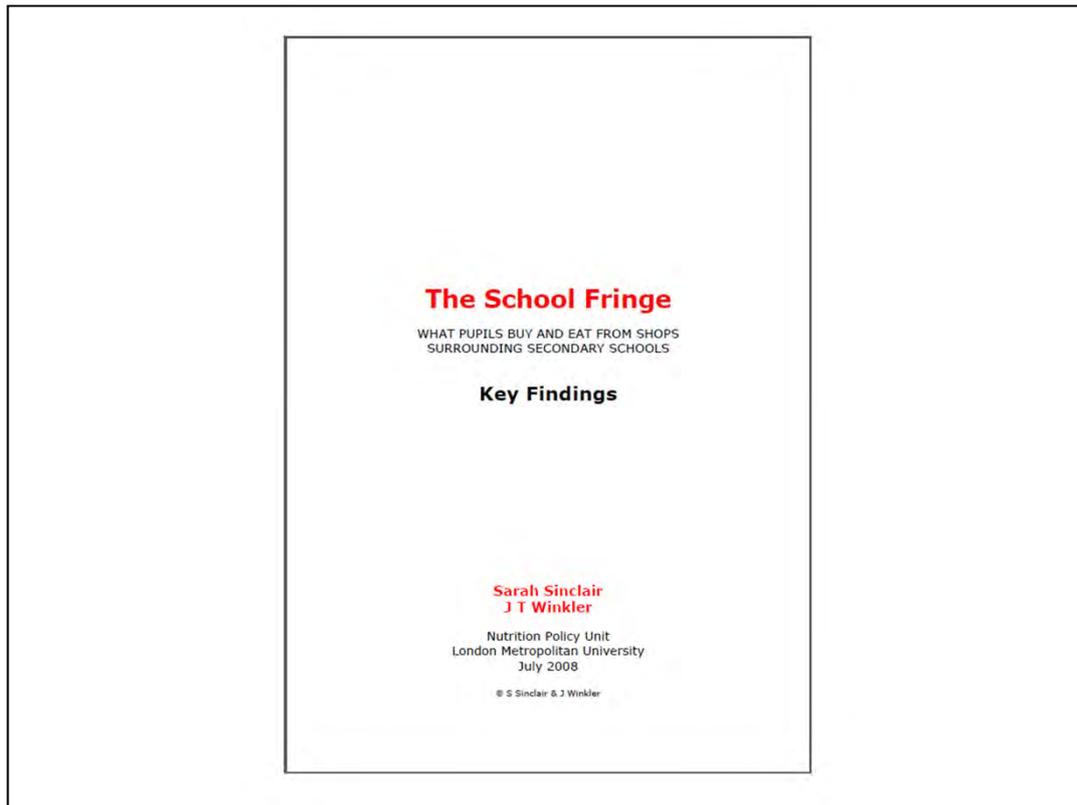
Conceptualising school neighbourhood exposure



what we are calling the school neighbourhood may also be the home neighbourhood. The dark blue line defines the catchment for this school – where most of the children attending it will live.

These mechanisms are likely to differ considerably by individual characteristics – two big ones being age (independent mobility, being allowed out at lunchtime), and mode of travel to school – are children who are driven to school exposed to this env in the same way as children who walk?

It is understanding some of these mechanisms that comes from the other stream of research...



Several studies and reports have taken an observational approach to understanding how and when children interact with the school neighbourhood, or “Fringe” We start in 2008, with London Metropolitan University’s report on the school fringe which observed two London secondary schools in different settings. They identified food outlets near their schools, asked school pupils to complete a food frequency questionnaire, which considered just the school day, and also asked where foods were obtained from. In addition they spent time observing the purchases of pupils within the fringe area, and assessed their nutrient content.

The School Fringe

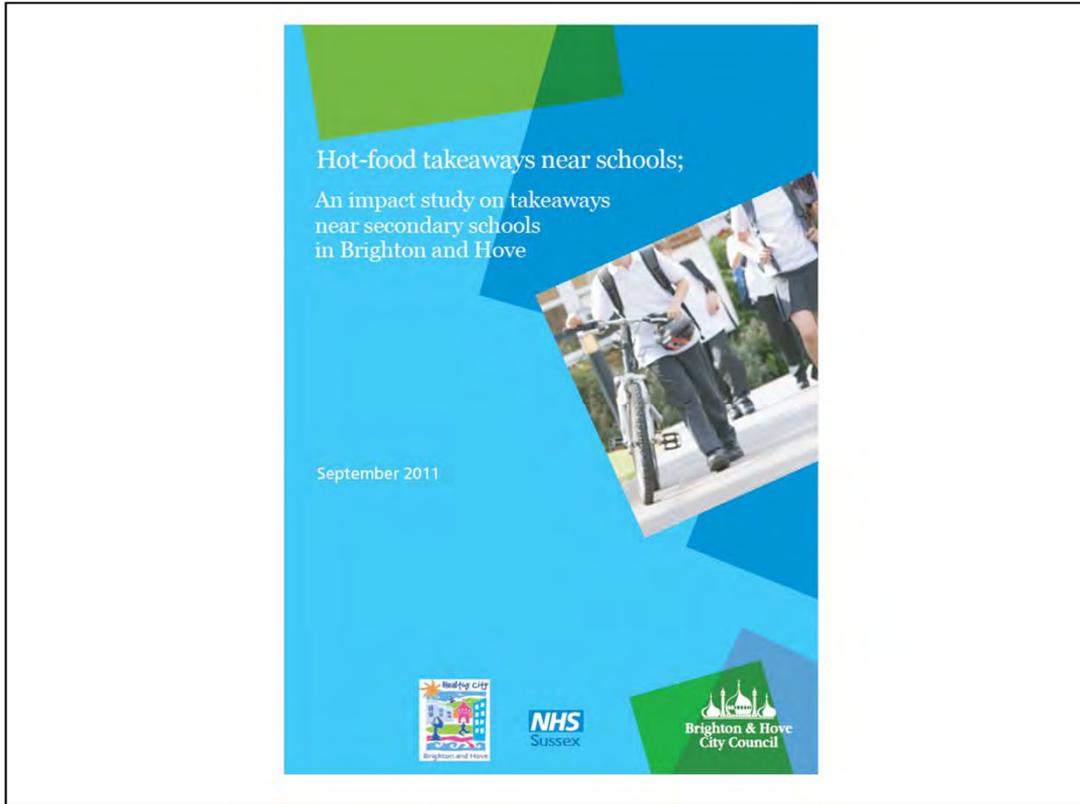
Key findings

- ✦ FFQ showed that children bought food in the fringe average of 6 times a week, and 80% of children bought something at least once a week
- ✦ Sugar was the main nutritional problem with foods purchased in the fringe
- ✦ The outlets used were not necessarily the closest, but the ones on transport routes to the school

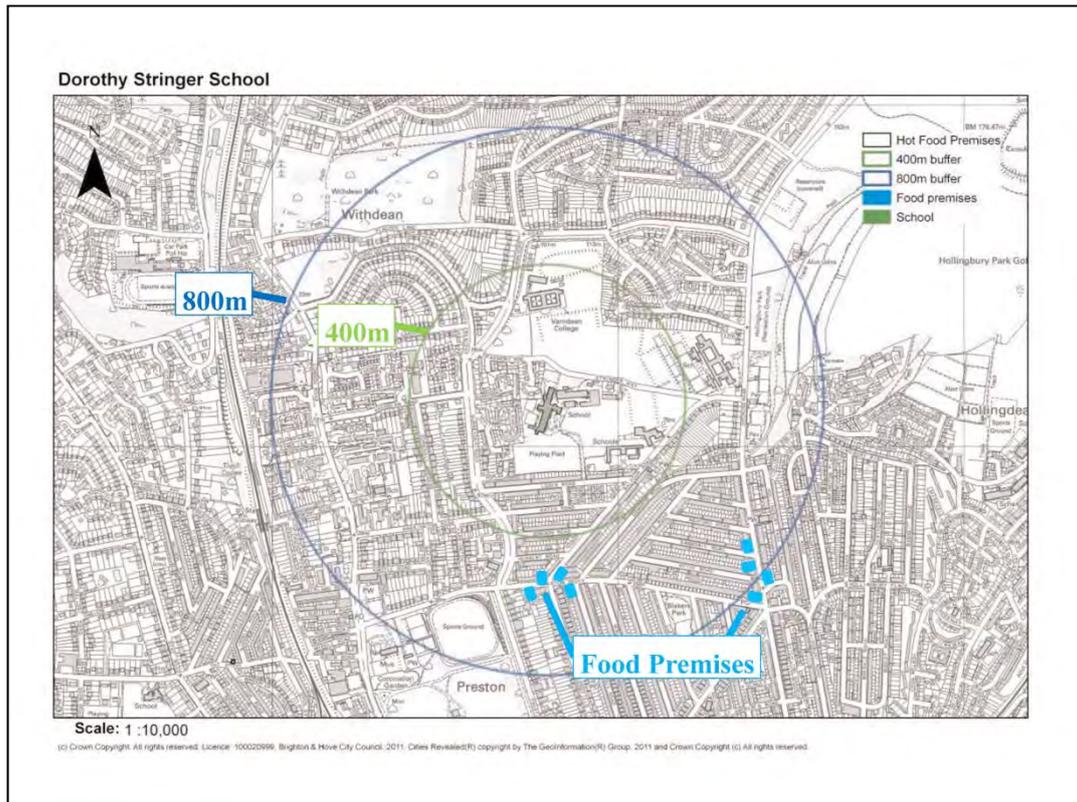
The results from their FFQ showed that a large majority of pupils made use of the school fringe, with an average of 6 purchases per week – more than one a day.

Their observations noted that the foods purchased were typically nutritionally quite poor, with high sugar levels a particular concern. In terms of added sugars, foods purchased in the fringe provided a third more energy than is recommended.

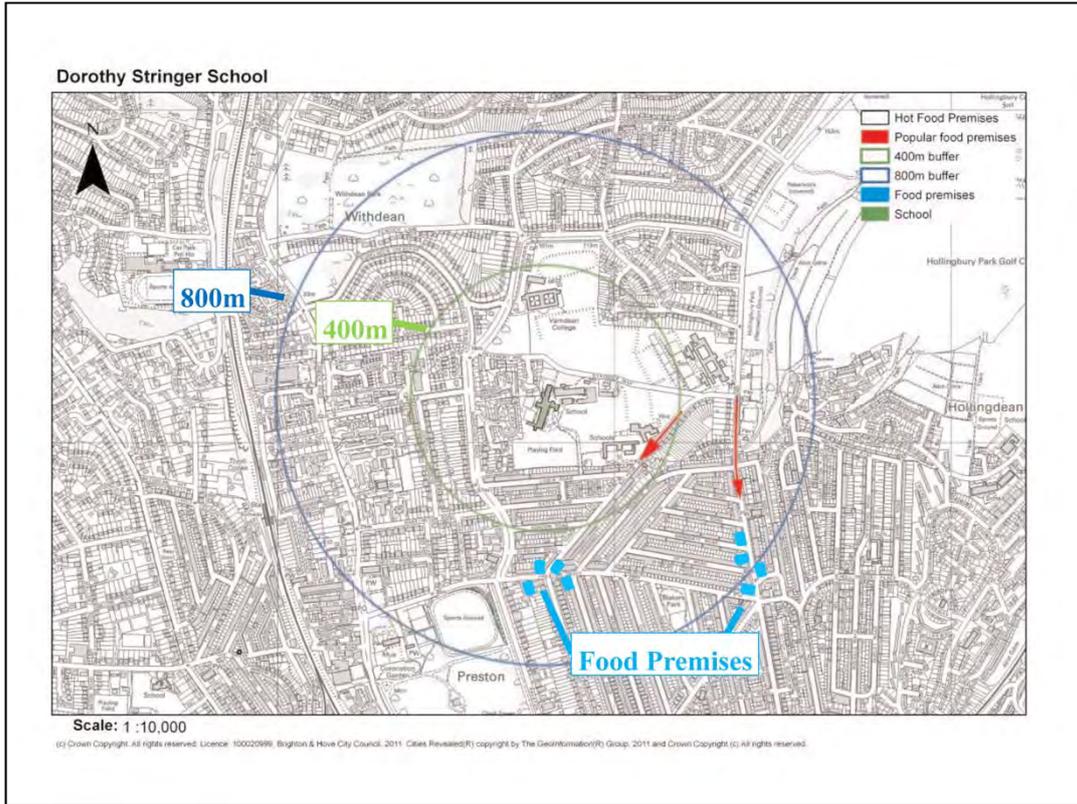
And finally, they found that proximity to school was not the most important factor for children when deciding which outlets to use – pupils used outlets along their routes to school, and were highly conscious of cost.



Similar methods have since been used elsewhere, including by Brighton and Hove Council who wanted to assess the potential value of implementing restrictions on the siting of fast-food outlets near schools



Similarly they mapped food outlets around secondary schools, and observed pupil behaviour at lunchtime. Here we have a map of one of their schools showing the location of food premises in relation to 400m and 800m buffers...



And here is where they observed pupils going – following routes to two different clusters of outlets, some apparently more than a 10 minute walk away.

Brighton and Hove

Key findings

- ✦ Large numbers of children left schools at lunchtime
- ✦ Many children travelled beyond the 400m boundary, and some went further than 800m
- ✦ Different types of food outlets were used; convenience stores, supermarkets, fast-food restaurants
- ✦ School lunchtime policies key to reducing use of the fringe

Their key findings were...

- That a lot of children left school at lunchtime, although this was dependent on a schools policy – half their schools did not allow children out at all.
- Some children appeared to walk quite a long way in their lunchbreak – well beyond the 400m the council was proposing as the fringe. Some children were also seen to walk beyond the 800m often used as a neighbourhood definition in the first stream of research, and what is deemed to be a 10 minute walk.
- Brighton and Hove were undertaking this work in order to assess the potential impact of restricting fast-food outlets in school fringes, but they found children used different types of outlets – convenience stores and supermarkets as well as fast-food outlets.
- They concluded that school policies, basically not allowing children out at lunchtime were key.

Observational studies

Limitations

- ✦ Include a small number of schools in a limited geographic area
- ✦ Only consider food purchases and consumption during the school day
- ✦ So far focused on urban areas and secondary schools

This type of study is also not without its limitations.

The detailed and time-consuming nature means that a small number of schools in a limited geographic area are included.

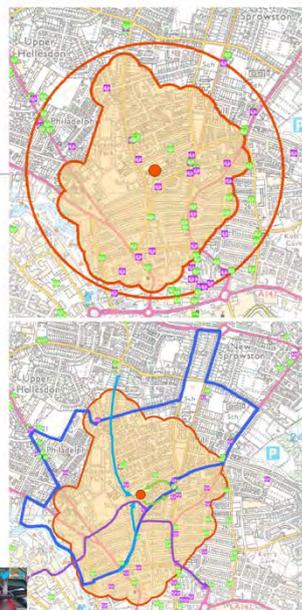
They can only consider food purchased during the school day – at lunchtime, and on arrival at and departure from school – but they cannot assess how this fits into overall intake, nor assess purchases and diet further along routes to and from school

And so far, this work has focused on secondary schools in urban areas – do the same behaviours apply in younger children or in more sub-urban or rural areas?

What does it all mean?

Unanswered research questions

- ✦ Can we improve our models of the school neighbourhood?
- ✦ How do younger children and their parents interact with the school fringe?
- ✦ Can we evaluate some of the solutions that are already being implemented?



So, we currently do not have very good evidence for if and how to regulate the school neighbourhood food environment – our large scale models do not show consistent associations between the presence of food outlets near schools and the outcomes we are actually interested in – i.e. overall diet and weight status, and yet the smaller, observational studies suggest that this environment is well used. So, I suggest these areas for future research...

The models of the school neighbourhood that we use need to be improved, to try and account for the paths children take through them, how they relate to home environments, and how the foods purchased through interactions with the school neighbourhood contribute to overall intake. Can we go from this (original model, top), to something more like this... (conceptual model, middle). These models are important – assessing the impact of the school fringe or neighbourhood on overall intake is particularly important if we want to assess the public health benefit of any school-fringe base intervention, including the implementation of planning restrictions. Taking a modelling approach, rather than an intensive observational one enables us to investigate a much larger number of schools relatively quickly and across a wide ranging geographic area.

In CEDAR we are looking to better understand how children use their school environment using food diaries and GPS devices to track their movement– this will allow the observation of interactions along the route to school, and

link it to overall food intake.

It is also important to fill in the gaps, so for example observational studies of primary schools, and parents' use of school environments.

And finally, potential solutions are already being implemented, so thorough evaluation of these would be beneficial. They include the councils that are already using proximity to schools as an assessment criteria for A5 planning applications, 'locked gate' policies at schools, through to the more innovative solutions such as the provision of healthier takeaway options near to schools, such as the Box Chicken initiative currently trialing in several London boroughs.

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