Can improving the neighbourhood food environment reduce obesity?

Evidence and research priorities in the UK

Dr Steven Cummins

Department of Geography
Queen Mary, University of London, UK

Email: s.c.j.cummins@qmul.ac.uk
The rise of obesity

- The prevalence of obesity is rising very rapidly in both developed and developing countries.
- In 2004 it was estimated that in the UK obesity had an annual combined cost of £3.3 to £3.7 billion.
- Direct costs to the NHS of obesity £1.1 billion, indirect costs from premature mortality of £1.1 billion, and economic costs of £1.3 to £1.45 billion through lost years of productivity.
Obesity & SES

- Higher rates of obesity are associated with low income and the education but individual social and psychological factors do not adequately explain the rise in overall obesity prevalence.

- It has also been discovered that dietary patterns and obesity rates vary spatially. Living in a low income or deprived area is independently associated with the prevalence of obesity and a poor diet.

- Such associations have been consistently reported in the UK, Netherlands, Sweden, Australia, USA and Canada.
Environment matters?

- The knowledge that diet and dietary outcomes vary spatially and are not completely explained by individual risk factors suggests that ‘environment’ matters.

- Speculation that this may be due to a process of ‘deprivation amplification’ whereby exposure to poor quality neighbourhood food environments amplifies these individual risk factors.

- Though the contextual effect of deprivation clearly matters we need to unpack the ‘black box’ of deprivation and specify the likely causal pathways.
The modern food environment?
Can a city make you fat?

Can a city make you fat?
Jan. 27, 2006
MEGAN OGILVIE
SPECIAL TO THE TORONTO STAR

During a one-hour walk...of a small section of New York City... Rundle points out different environmental features that may influence obesity.

[For example] A farmer's market in Union Square that sells fresh greens and organic meats three days a week...may encourage people to make healthy food choices.

None of this is, like, rocket science," laughs Rundle. "None of this is, like, some grand esoteric formula. A lot of it has a `that-kind-of-makes-sense' quality to it. But nobody has looked at these (kinds of) data and nobody has analyzed these (kinds of) data to see if it's true."
Neighbourhood food environments: local grocery stores and fast-food outlets

- Environmental influences on diet involve numerous settings such as home, work, school and neighbourhood.

- In this presentation I want to focus on neighbourhood influences on diet; other issues are important.

- Specifically two hypothesized pathways:
  - Access to foods for home preparation and consumption
  - Access to out-of-home ready-made foods (‘fast-food’).
Evidence for an environmental effect of grocery stores on diet in the UK

- Long, though limited, history of work in this field
- Earlier work suggested that food was more expensive and less readily available in poorer areas – areas often termed ‘food deserts’
- Studies were often small, unsystematic and sometimes mis-interpreted (see Cummins & Macintyre, 2002)
- Classic example is Mooney (1990)
<table>
<thead>
<tr>
<th></th>
<th>‘Healthy’ Basket A</th>
<th>‘Unhealthy’ Basket B</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of shops</td>
<td>Cost</td>
<td>SD</td>
<td>Cost</td>
</tr>
<tr>
<td>Entire District</td>
<td>9</td>
<td>£11.51</td>
<td>91p</td>
</tr>
<tr>
<td>Deprived Area</td>
<td>5</td>
<td>£11.13</td>
<td>43p</td>
</tr>
<tr>
<td>Affluent Area</td>
<td>4</td>
<td>£11.98</td>
<td>111p</td>
</tr>
</tbody>
</table>

**p<0.01, ***p<0.001
(Source: Mooney 1990 Journal of Human Nutrition & Dietetics, p.114)
Policy context in the UK

‘In the UK, average consumption [of fruit & vegetables] is only about three portions a day, and a fifth of children eat no fruit in a week. Information is important, but the food choices people can make are shaped by the availability and affordability of food locally’

Department of Health (2000)
The NHS Plan: A Plan for Investment, A Plan for Reform
Glasgow Urban Foodscape Study

- With this in mind, as a graduate student, I conducted a systematic observational study of food price and availability in Glasgow neighbourhoods.


- Won’t go into detail here but the findings suggested that food was either no different in price or in a few cases slightly cheaper in poorer areas compared to richer areas.

- Also, overall larger numbers of food stores in poorer areas.
Subsequent UK observational studies..


- No independent effect of food retailing on diet and fruit and vegetable consumption found in both studies

- No clear evidence of ‘food retail deserts’ in Newcastle though problems do exist for a minority of residents

- Dibsdall’s respondents have reported that physical proximity to shops was not an issue
BUT...only observational evidence

- Most UK studies have simply investigated the association of number of stores and the price and availability of food within them with area deprivation.
- Recent evidence is equivocal.
- Studies of linking grocery stores directly to diet/obesity remain rare.
- Evidence has been purely observational; causality cannot be determined.
- Studies are open to criticism as it may be, for example, that lower availability of certain foods are due to low demand rather than a simple failure to stock.
Prescribing the superstore - a tale of two cities

- In light of the current UK policy context two recent studies have evaluated the effects on diet or opening a large food supermarket in a deprived urban neighbourhood.

- Studies are the first of their kind.

- Leeds Food Deserts Study (Wrigley, Clarke, Guy et al).

- Glasgow Superstore Study (Cummins, Petticrew, Sparks et al).
Leeds Food Deserts Study (1)

- An uncontrolled before/after study in Seacroft, a deprived area of Leeds (Wrigley et al, 2003)
- Evaluated what happened when existing grocery provision was demolished and new provision constructed
- Increase of between 0.01 and 0.47 portions of fruit and vegetables per day for those who switched to using the new store after it opened
- Increases were greatest (0.47 portions per day) in the groups that had the lowest intakes of fruit and vegetables at baseline
Leeds Food Deserts Study (2)

- Also an increase in walking trips associated with grocery shopping (greater physical activity)
- Increases in consumption remained after controlling for individual socio-demographic factors
- So, on the surface, an interesting and apparently successful strategy for improving food consumption patterns in deprived areas
Glasgow Superstore Study

- Two year study which ran from September 2001 to December 2002 in two neighbourhoods in Glasgow City, Scotland, UK

- Designed as an exploratory pilot study of a ‘naturally occurring’ experiment in a food retail deficit area

What are the study sites like…?

You'll be lucky to live to 60 here. But it's not the third world ... it's Glasgow's East End

Shettleston's diet of chips [fries], fags [tobacco] and booze means that life expectancy is actually falling in one of the most deprived parts of the UK

David Smith
Sunday March 14, 2004
The Observer
### Dietary change – multivariate appraisal

<table>
<thead>
<tr>
<th></th>
<th>Intervention Effect</th>
<th>Std Error</th>
<th>T</th>
<th>P-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>+0.03</td>
<td>0.140</td>
<td>0.19</td>
<td>0.846</td>
<td>-0.25 to 0.30</td>
</tr>
<tr>
<td>Vegetables*</td>
<td>-0.11</td>
<td>0.168</td>
<td>-0.66</td>
<td>0.597</td>
<td>-0.44 to 0.22</td>
</tr>
<tr>
<td>Fruits &amp; Vegetables*</td>
<td>-0.10</td>
<td>0.249</td>
<td>-0.40</td>
<td>0.692</td>
<td>-0.59 to 0.40</td>
</tr>
</tbody>
</table>

* Quadratic term
Summary – diet outcomes

- Inconclusive evidence for an intervention effect for diet and general health in main sample

- Marginal improvement or substantial negative change – statistically inconclusive

- For ‘switchers’ there is an indication of some intervention effect for dietary outcomes – not statistically significant

- Important that changes in the intervention site were similar to Leeds Study; but after allowing for change in the comparison site the intervention ‘effect’ disappears
Evidence for an environmental effect of fast-food outlets in the UK

- Evidence base is very sparsely populated
- What studies do exist are limited by being ‘ecological’ in design
- Useful for hypothesis generation though!
- Involved in three ecological studies in the UK
  - two national (England & Scotland)
  - one local (Glasgow)
Fast-food chains and area deprivation in the UK

- We initially undertook a simple national study investigating whether MacDonald's Restaurants were located in poorer neighbourhoods in the UK (see Cummins et al; 2005, *AJPM*).

- Statistically significant positive correlation with quintile of area deprivation.

- Linear trend with of greater numbers of outlets in increasingly poorer areas indicating ecological observational evidence for a ‘dose-response’ effect.
We followed this up with an in depth look at Glasgow only this time including independent outlets in addition to global chains (see Macintyre et al; 2005, *IJBNPA*)

This study composed of 1301 outlets in the city

We found a confused picture, no clear pattern with area deprivation
Substitution or concentration?

- This difference between the two studies raises the question that…

- Are global chains, like McDonald’s, are more likely to be concentrated in poorer neighbourhoods (a ‘concentration’ effect)

- Or are stores like MacDonalds simply substituted by a competing chain in more affluent areas (a ‘substitution’ effect) with the effect that all chains would be evenly spread across all types of neighbourhoods.
Four biggest fast-food chains and area deprivation (under review)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>95% CI</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(lower-upper)</td>
<td></td>
</tr>
<tr>
<td>England &amp; Scotland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.0169</td>
<td>0.0108-0.0231</td>
<td>188</td>
</tr>
<tr>
<td></td>
<td>0.0328</td>
<td>0.0267-0.0389</td>
<td>357</td>
</tr>
<tr>
<td></td>
<td>0.0441</td>
<td>0.0380-0.0503</td>
<td>474</td>
</tr>
<tr>
<td></td>
<td>0.0647</td>
<td>0.0586-0.0708</td>
<td>671</td>
</tr>
<tr>
<td></td>
<td>0.0761</td>
<td>0.0700-0.0822</td>
<td>845</td>
</tr>
<tr>
<td></td>
<td>0.0469</td>
<td></td>
<td>2535</td>
</tr>
</tbody>
</table>

F=58.339, p=0.000
To summarise UK studies...

- For the neighbourhood grocery retail environment little observational evidence found for an association with diet..

- For neighbourhood grocery retail environment conflicting experimental evidence; though the study with the more robust study design found no evidence of an effect.

- For neighbourhood fast-food environment some evidence that fast-food outlets locate in poor areas, but perhaps only global chains.

- For neighbourhood fast-food environment evidence for a ‘concentration’ rather than ‘substitution’ effect.
Unanswered questions?

- Weak conceptual models – simply improving provision is an inadequate model for health improvement
- Poor exposure assessment – exposure varies in time and space; no standardized and validated instruments. This introduces error so that small population effects are missed
- Cumulative assessment of food environment - is investigating neighbourhood alone appropriate?
- Is it reasonable to expect a population effect or will interventions only work on some groups?
- UK studies that link food environments to obesity do not exist
Unanswered questions?

- Understanding interactions between individuals and environmental factors at varying scales

- Understanding mediating processes is of paramount importance. For example symbolic versus physical access to health promoting resources, individual and family self-efficacy, stakeholder involvement in retail developments, effect of price promotions and social marketing, household income and knowledge, affordability and acceptability

- Macro-level policy may also be important and may have local expression—e.g. regulation of fast-food; planning controls
Does neighbourhood food environment matter?

- Observational evidence tells us that environment matters for obesity....but we don’t really know how just yet

- Area of work is in its infancy

- Emerging picture of complexity – importance of mediators

- Improvement of concepts and field methods required

- Integrated approach to multi-dimensional community-based research is urgently needed