

# **Can improving the neighbourhood food environment reduce obesity?**

## **Evidence and research priorities in the UK**

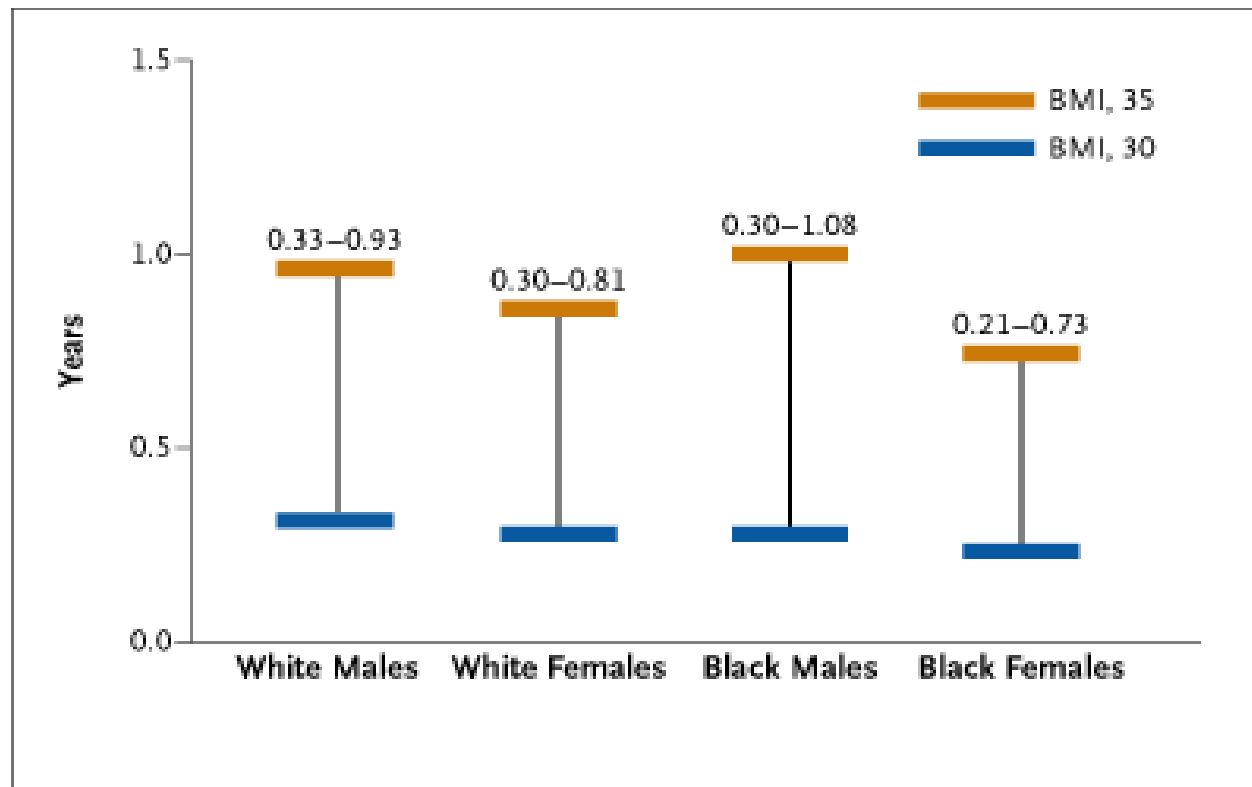
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# The rise of obesity

- 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
- Directs 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



From: Olshansky et al (2005) A potential decline in life expectancy in the United States *NEJM* 352;11

# 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 misinterpreted (see Cummins & Macintyre, 2002)
- Classic example is Mooney (1990)

## Mooney (1990)

	<i>No of shops</i>	'Healthy' Basket A		'Unhealthy' Basket B		<i>Difference (%)</i>
		<i>Cost</i>	<i>SD</i>	<i>Cost</i>	<i>SD</i>	
<b>Entire District</b>	<b>9</b>	<b>£11.51</b>	<b>91p</b>	<b>£9.72</b>	<b>118p</b>	<b>18**</b>
<b>Deprived Area</b>	<b>5</b>	<b>£11.13</b>	<b>43p</b>	<b>£9.23</b>	<b>40p</b>	<b>21***</b>
<b>Affluent Area</b>	<b>4</b>	<b>£11.98</b>	<b>111p</b>	<b>£10.32</b>	<b>150p</b>	<b>17*</b>

\*\*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
- Price and availability of 57 items surveyed in 325 grocery stores across Glasgow (see Cummins & Macintyre, 2002, *Urban Studies* for details)
- 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..

- White et al (2004) Newcastle Food Access Study. Most comprehensive of it's type
- Pearson et al (2005) Smaller study in Barnsley, Dibsall (2003)
- 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
- Dibsall'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 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 a exploratory pilot study of a 'naturally occurring' experiment in a food retail deficit area
- Full results in Cummins et al (2005) *Journal of Epidemiology & Community Health* and Cummins et al (in press) *Environment & Planning A*

## 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

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

## 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

## Caution required.....

- 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 MacDonaldis 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)

## England & Scotland

Mean	95% CI (lower-upper)	N
0.0169	0.0108-0.0231	188
0.0328	0.0267-0.0389	357
0.0441	0.0380-0.0503	474
0.0647	0.0586-0.0708	671
0.0761	0.0700-0.0822	845
0.0469		2535

**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 it's 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**