

## **Reducing inequalities in health and diet: findings from a study on the impact of a food retail development**

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### **Abstract**

The health and diet impacts of a large-scale food retail development within a deprived area of Glasgow (Springburn) are reported. The study used a prospective quasi-experimental design which compared changes in diet and psychological health in an area where a new hypermarket was built (the intervention area), with a similarly-deprived comparison area in Glasgow (Shettleston). A postal survey was undertaken both before and one year after the hypermarket was built, to assess changes in diet, self-reported health, and perceptions of neighbourhood. Changes in the retail structure of both areas were assessed through a before and (repeated) after intervention shop count survey. Qualitative data on diet, the neighbourhood and the impact of the store were collected through focus groups.

The quantitative study found limited improvements in diet and health. There was weak evidence for the impact of the hypermarket on population diet. There was weak evidence that poor psychological health in the intervention area reduced. Amongst those who 'switched' to the new hypermarket there was weak evidence of a small improvement in mean fruit and vegetable consumption but good evidence of psychological health improvement. Qualitative and retail survey results reinforce this, identifying perceptions of areal improvement through redevelopment and a small positive impact of the new store on the intervention area's retail structure.

Keywords: Diet, health, intervention, food deserts, hypermarket, Glasgow

## **Reducing inequalities in health and diet: findings from a study on the impact of a food retail development**

The existence of spatial inequalities in access to food (particularly affordable and healthy food) and diet is widely accepted (e.g. O'Neill 2005). In the late 1990s the metaphor of the 'food desert' - deprived communities with limited access to adequate food retailing and food products (Beaumont et al 1995) - captured government, public, media and academic attention. The existence and extent of food deserts is, however, controversial (Cummins and Macintyre 2002a, White et al 2004), not least because of definitional, measurement and behavioural contradictions. Discussion of the issues surrounding the origins, definitions and presence or otherwise of food deserts can be found in the special issues of *Urban Studies* (2002) and the *International Journal of Retail and Distribution Management* (2004), and in the report by White et al (2004).

The origins and definitions of food deserts are less important however than the fact that government policy in the United Kingdom in the late 1990s began to reflect academic and popular concerns about social inequality and health (Acheson 1998, Department of Health 1999a, b, Social Exclusion Unit 1998, 2000). Reducing inequalities became, and remains, a major policy priority (Department of Health 2004, Wanless 2004). In particular it was suggested that solving the food access 'problem' would help to solve the diet-related health problems of the UK (see Wrigley 2002 for a good discussion). Policy thus opened up the idea of retail-lead area-based interventions (Wrigley et al 2002a) stimulating a regeneration process in deprived communities and enhancing local access to a cheaper and more extensive range of healthy foods (particularly fresh fruits and vegetables). Tesco in particular began to pursue the development of large superstores or hypermarkets in deprived areas, under the banner of neighbourhood regeneration (Tesco

Stores 2002a, b). It was believed that such stores through improving local access to food would thereby improve (or even ‘solve’) the health and diet problems of local residents.

However the development of government policy was moving more quickly than corresponding development of the evidence base. Subsequent to the formulation of policy there have been two major pieces of research undertaken in the United Kingdom (see Cummins et al 2005a).

A project in Newcastle (White et al 2004), funded by the Food Standards Agency, involved a multi-level observational study that aimed to investigate the relationship between dietary intake and socio-economic factors at the individual, household and neighbourhood levels. The study also investigated retail access to a ‘healthy’ and affordable diet, in order to determine whether ‘food deserts’ existed and, if so, to describe their characteristics.

White et al (2004) concluded that “food deserts” only exist for a minority of people who do not or cannot shop outside their immediate locality and for whom the locality suffers from poor retail provision of foods that make up a ‘healthy’ diet. In addition they noted that the key predictors of healthy eating are primarily dietary knowledge, relative affluence and a ‘healthy’ lifestyle and that retail provision was not independently associated with diet (confirming findings by Dibsall et al 2002, 2003). This suggests that improving retail provision for those people whose diet is ‘less healthy’ than desirable, may not be as important as previously thought. The study shows that there is no evidence that poor retail provision is a primary cause of an ‘unhealthy diet’, although poor retail provision may be an important contributing factor in some well-defined

circumstances. They recommend that approaches to tackling food poverty should address poor knowledge and low skill levels related to the acquisition and preparation of a 'healthy' diet, as well as questions of retail access.

A study in Leeds (Wrigley et al 2002b, 2003), funded by the Economic and Social Research Council, has been described by its authors as the first-ever UK study of the effects of major new food retail provision on diet in a 'food desert'. The project was an uncontrolled before-and-after 'intervention' study of changes in food consumption patterns in a highly deprived area of Leeds - the intervention in this case being a new Tesco superstore.

Wrigley et al (2002b, 2003) concluded that there was significant improvement post-intervention in terms of food access. The average distance travelled to the main food store fell from 2.25 kilometres to less than 1 kilometre. The percentage of people walking to their main food store tripled to over 30%. Improved food retail access in the area was accompanied by improved diet amongst some groups of residents. A statistically significant increase in fruit and vegetable consumption was observed amongst those switching to the new store and a non-significant increase among those respondents who had switched from limited range discount stores. These changes in diet were however small in absolute terms (an increase of 0.25-0.5 portions of fruit or vegetables per day (approximating to three portions per week)) and focused within a tightly defined sub-population.

These two major studies, employing differing designs and methodologies, thus provide some contrasting outcomes. This is the context in which our results are reported. Our

study also aimed to assess the impact on diet and health of improving access to food through the development of a large new food store in a deprived community. Additionally it considered more general questions about impact on the broad retail structure of an area and issues of general well-being and perceptions of the locality. The 'intervention' in this case was the development of a new Tesco hypermarket (opened November 2001) in one of the most deprived locations in the United Kingdom (Springburn, Glasgow). In this study the effects of the intervention were evaluated using a quasi-experimental design utilizing a 'before and after' approach, which also included an equally deprived comparison site where the intervention did not take place (Shettleston, Glasgow). The two areas included in the study were multiply deprived, but could not be referred to as 'food deserts' in a traditional sense, as Glasgow has quite an extensive retail food provision system (Cummins and Macintyre 2002b). Results from the various strands of this study are now being published, including visual evidence of change (Cummins et al 2005b), diet and health aspects in an epidemiological context (Cummins et al 2005c) and impacts on retail structure (Cummins et al 2005d). This paper provides the definitive over-arching results of all strands of the research project.

**Our** study has a different methodology and a broader focus than the Leeds study (Wrigley et al 2003). With community-based interventions such as a hypermarket, indirect as well as direct impacts upon health may conceivably operate. For example major investment in an area (such as that resulting from new food retail stores) may affect levels of social inclusion and employment which in turn may affect health. Potential mechanisms for health improvement could be conceptualised to operate in two ways. First, a new hypermarket may affect health behaviours by increasing access (physical and economic) to a range of relatively healthy produce and by increasing

opportunities to improve food selection and consumption patterns. Secondly (and much more indirectly), there may be some enhancement of community self-esteem, due to highly visible large-scale commercial investment in a previously marginalised area, and a local sense of increased parity with other areas.

Outcomes other than dietary change are important, as these allow the examination of the possible mechanisms by which social interventions (such as retail interventions) may affect health by changing people's daily lives. These changes will almost certainly not be reflected in immediate changes in morbidity or mortality rates. However there may be effects on (for example) people's levels of participation in social networks, leading to changes in indicators of social inclusion, self-esteem, psychological health and perhaps (eventually) changes in use of health services and diet. Causal pathways for changes in health are complex, and plausible intermediate outcomes (for example, measure of social integration) need to be assessed as well as both the positive and negative effects of the monitored intervention.

The aim of this paper therefore is to attempt to understand the impact of a new food retail development on a deprived area in terms of diet and health, general well-being and retail structure. In presenting the overall results of this study, this paper will also address the generalisability of the results of previous research and issues of government policy to address spatial inequalities in food access, diet and health.

### **The Project Methodology**

In order to attempt to infer causality in assessing the impact of a non-healthcare intervention on health and diet, an intervention and a comparison area were selected.

Springburn in Glasgow was eventually selected as the intervention site, with Shettleston as the comparison area. Intervention and comparison areas were matched by level of deprivation (Carstairs-Morris DEPCAT), with each area having a DEPCAT of 7 (A Carstairs-Morris DEPCAT score of 1 represents the most affluent areas and 7 represents the most deprived). We originally used DEPCATs based upon the 1991 census to select the areas, but later confirmed the deprivation status of the two areas using DEPCATs based upon the 2001 census (McLoone 2004). Data from NHS Health Scotland indicate that these two areas are among the most deprived in Scotland (NHS Health Scotland 2004). They have high levels of smoking (about 50% in both areas), a mean income of around one-third below the Scottish average, low levels of fruit and vegetable consumption (about a third eat fruit daily), and high levels of ill-health (about 30% with limiting long-standing illness). Male life expectancy in both areas declined 1991-2001 to 66.6 years (intervention) and 63.9 years (comparison), as compared to the Scottish average of 73.3 years.

The hypermarket itself opened November 2001 and was built on the site of an old British Rail engineering works (Cummins et al 2005b). As well as being the largest Tesco store in the Glasgow area, this development was widely seen as making a significant contribution to community regeneration by providing long-term training and job security for local people. It was anticipated that around 450 jobs would initially be created. Tesco agreed to train the local long-term unemployed in basic and retail skills with the promise of a job after successful completion of their training. This reflected Tesco's wider objective of forming regeneration partnerships. In the case of Springburn this involved links with Glasgow Chamber of Commerce, a local training college and regeneration companies (Tesco Stores 2002b).

The research project objectives were to:

- (a) Describe and compare self-reported health, psychological wellbeing, food consumption patterns, food access and the retail base in an intervention and a similarly deprived comparison neighbourhood.
- (b) Evaluate whether self-reported changes in physical and mental health, food consumption patterns, and food access occur following the opening of a large hypermarket.
- (c) Investigate residents' perceptions of their neighbourhood and other neighbourhoods after the intervention and explore impacts on sub-groups.
- (d) Examine the impact of the hypermarket on local retail provision.

The study used three main research methods to meet these objectives.

#### *Quantitative Postal Survey*

A 'before and after' postal survey of a representative sample of residents was undertaken in the two areas (intervention and comparison). A random sample of households, stratified by area, was drawn from the postcode address file supplied by CACI Ltd. A total of 3975 postal questionnaires were administered pre-intervention during October 2001. Respondents were followed-up after a 12-month interval. It was requested that the main household food shopper filled in the questionnaire. At the baseline survey, non-respondents to the first questionnaire were first sent a postal reminder at two weeks, followed by a second reminder two weeks later accompanied by another copy of the questionnaire. In the follow-up survey (post-intervention) a £10 shopping voucher (not

for the intervention store) was offered to each respondent as an incentive to return the questionnaire.

For each respondent, data on five main health outcomes were collected. Diet-related outcome variables were operationalised as fruit consumption in portions per day, vegetable consumption in portions per day, and fruit and vegetable consumption in portions per day (obtained through the simple addition of fruit and vegetable indicators). General health outcomes were operationalised as respondent self-rated health (poor, fair, good, excellent), and psychological wellbeing as measured by the 12 question version of the General Health Questionnaire (GHQ-12). GHQ-12 is a well-validated, internationally recognised instrument to assess psychological morbidity. Self-rated health was dichotomised into excellent/good and fair/poor. GHQ score was dichotomised into 0-3 and 4+ (a GHQ score of 4+ indicating poor psychological health). Demographic data on sex (male/female), age (in age groups: 16-24, 25-34, 35-44, 45-54, 55-64, 65+), educational attainment (school, further/work-based, higher) and economic activity (economically active/inactive) were also collected. Item non-response for some questions (for example current occupation) necessitated excluding these variables as confounders in the analysis. However as the two communities were matched by deprivation category, we concluded that confounding by occupational social class (on which the deprivation score is partly based) was likely to have been limited by the matching of communities.

Response rates at baseline for the postal survey were disappointing. Both areas are categorised as having a high level of material deprivation. Such areas traditionally suffer from particular problems of non-response in postal surveys. It has been suggested that response rates are in decline in poorer areas of the UK (Parry et al 2001). Reasons for

this include over-investigation (“research fatigue”), disempowerment and decreasing social engagement among deprived communities, rapid flux in the population, as well as a general mistrust of scientific research. Response rates in comparison and intervention areas were comparable (15.5% vs 14.84%). Response rates at follow-up of the baseline survey were good (68.40% overall) and broadly comparable between comparison and intervention areas (71.29% vs 65.18%).

### *Qualitative Data Collection*

Nine mixed-sex focus groups were undertaken in the intervention area, 6-7 months after the opening of the hypermarket. Purposive sampling was employed to select participants from those who had previously responded to the postal survey, and had agreed to be contacted again. Additional participants were recruited via existing community groups, and through posters displayed in the local area. Participants were selected to provide a wide range of responses, to ensure that there was some distribution in terms of age, sex, access to own transport, employment status, number of people in household, and whether there were children in the household or not.

Photographs of the area were used to initiate discussion about people’s experiences of living in the area. A ‘theories of change’ approach was employed which involved outlining mechanisms and pathways through which we expected general wellbeing to be affected. This ‘theory-testing’ approach to qualitative research, rather than employing an open-ended exploratory approach, was designed as the most appropriate for the overall aims of this research project. Participants were also given the chance to discuss freely the topics of health, community and shopping and the new hypermarket. Issues such as participation in social networks, social cohesion, social inclusion, self-esteem, and

general wellbeing were discussed. Focus groups lasted between 1-1½ hours, and participants were given £10 as a token for their participation.

Focus group discussions were audio-recorded and transcribed verbatim, before data analysis was undertaken using NVivo© software. Data were initially coded according to predetermined theories of change, including the role of the new hypermarket within the community, and were additionally examined for emergent themes. Ten per cent of this coding was double-checked by the same researcher.

#### *Retail Shop Count Survey*

A retail shop count survey was mounted in both areas. This involved delineation of the boundaries of the two areas, survey work to ‘map’ the retail structure (October 2001) and repeat surveys on 6-monthly intervals to assess change (repeated to 2005). Data were collected on location and name and line of business.

## **Results**

#### *Quantitative Survey*

Initial analyses of continuous dietary outcomes (mean fruit and vegetable consumption in portions per day) were undertaken using a simple bivariate approach. Paired sample T-tests were employed in order to investigate unadjusted change *within* the intervention and comparison areas by simply comparing baseline reported mean fruit and vegetable consumption with consumption reported at follow-up within each of the two areas.

Multivariate analyses were also undertaken using analysis of co-variance (ANCOVA) models in order to investigate the population effect on consumption patterns of the new hypermarket by comparing changes in individual reported fruit and vegetable

consumption *between* the two areas. Analyses using ANCOVA models can allow for ‘dependency’ in repeated observations of a single continuous outcome variable within one individual. For example ANCOVA models can allow for errors in the estimation of effect sizes by allowing for the fact that past fruit and vegetable consumption predicts future fruit and vegetable consumption within the same individual. Using ANCOVA increases the precision of the standard errors generated by the model compared to those generated using simple linear regression. The models tested whether the post-intervention mean consumption in the comparison area was equal to the post-intervention mean consumption in the intervention area, having adjusted for the pre-intervention observed mean difference in consumption between the two areas. We also controlled for confounding in this data set by sequentially forward fitting age, sex, economic activity and education to the basic unadjusted model. We also investigated whether any effects existed for those who changed to the hypermarket as their main food shop (known as ‘switchers’) compared to those who did not, employing the same analytic strategy.

Initial analyses of categorical general health outcomes (GHQ-12 and Self-reported Health) were undertaken using a simple bivariate approach (McNemar  $\chi^2$ ). These categorical outcome data were further analysed using logistic regression within a multivariate model. We tested for interactions between available confounders in our data set (age, sex, education and economic activity) and general health outcomes. It was hypothesised that the opening of the hypermarket would have larger effects on women (women are the main food shoppers in this sample), the economically active (who may be able to better act on increased local food availability) the elderly (who may be able to act on increased local food availability, if availability improves within a reasonable travel distance) and those with lower levels of education (who tend to have lower levels of

consumption of fruit and vegetables). Where interactions with confounding variables were indicated stratum specific results are noted.

Table 1 summarises characteristics of respondents for whom data at baseline and follow-up were available (n=412). Females account for 61.9% of the overall sample (64.4% in the comparison area and 58.9% in the intervention area). The sample is relatively old. This is unsurprising as the survey instructed that the person mainly responsible for household food purchase should fill in the questionnaire. The intervention area has a younger demographic profile compared to the comparison area, with 23.4% vs 6% of respondents at baseline aged 16-34. In the sample as a whole 60.9% of respondents were economically inactive (that is respondents were either retired, a student, unemployed or not undertaking paid work). The majority of respondents (72.8%) had either Scottish standard grade or Scottish higher grade/work based training or education. The educational profile of respondents is similar in comparison and intervention areas. Socio-demographic differences in respondent attributes between intervention and comparison areas were not statistically significant.

Table 2 summarises the five diet and general health outcomes for both intervention and control areas at baseline and follow-up. These data indicate positive changes in all health outcomes in both communities, with the exception of the proportion reporting fair-to-poor self-reported health in the intervention community. However these improvements were only statistically significant for 2 of 5 indicators in the intervention community (fruit and vegetable consumption combined and poor psychological health) and 2 of 5 indicators in the control community (vegetable, and fruit and vegetable combined consumption).

*Impact of the new hypermarket – population dietary outcomes:* Table 2 shows, for all three measures of daily fruit and vegetable consumption that there is some evidence for a positive population increase in mean consumption over the follow-up period in the intervention area. The magnitude of mean change ranges from an increase of about 0.1 portions per day for fruit consumption (p=0.35) to 0.29 portions per day for fruit and vegetables combined (p=0.07). However this is mirrored by a similar change in the comparison area – for example, mean consumption of fruit and vegetables combined increased by 0.44 portions per day (p=0.003).

However the above simple bivariate analyses only investigate change within each area *separately*. They thus do not give a true picture of the overall population change in fruit and vegetable consumption in the intervention area that may be attributable to the intervention. A multivariate analytic strategy that allows for baseline differences in consumption between areas in one model is therefore required. Table 3 shows beta coefficients (changes in consumption in mean portions per day) for change in the intervention area compared with change in the comparison area. Using analysis of covariance (ANCOVA) models we estimated these intervention effects of the hypermarket on dietary outcomes after adjustment for baseline differences between areas in mean portions of fruit and vegetables per day, plus age, sex, education and economic activity. There was weak evidence for an effect of the hypermarket (see model 3) on mean fruit consumption (0.03, 95% CI -0.25 to 0.30) mean vegetable consumption (-0.11, 95% CI -0.44 to 0.22), and mean fruit and vegetables consumption combined (-0.10, 95%CI -0.59 to 0.40).

For completeness we also tested for linearity in these models by introducing a quadratic (non-linear) term and testing whether this model was an improvement on the original ANCOVA model (which assumes a linear relationship between pre- and post- dietary outcomes). There is evidence for an improvement in the estimation of regression coefficients in the model for mean vegetable consumption ( $p=0.048$ ) and fruit and vegetables combined ( $p=0.012$ ) when using this quadratic term. Thus model 4 in Table 3 shows beta coefficients (with 95% confidence intervals) for the intervention effect of the hypermarket with a quadratic term, adjusting for age, sex, education and economic activity. Overall there was little evidence for an intervention effect for either mean vegetable consumption ( $-0.11$ , 95% CI  $-0.44$  to  $0.22$ ) or mean fruit and vegetable consumption ( $-0.10$ , 95% CI  $-0.59$  to  $0.40$ ). For fruit consumption, model 3 is the final model which indicates a marginal increase in fruit consumption of 0.03 portions per day, but this is not statistically significant (95% CI  $-0.25$  to  $0.30$ ).

*Impact of the new hypermarket - general health outcomes:* Table 2 shows simple unadjusted changes *within* each of the intervention and comparison areas for self-rated health and psychological health using odds ratios and 95% confidence intervals. The odds of reporting fair or poor health increased in the intervention area (unadjusted OR 1.64, 95% CI 0.81 to 3.45) and decreased in the comparison area, (unadjusted OR 0.77, 95% CI 0.39 to 1.53), though both were not statistically significant. Conversely the odds of having poor psychological health increased non-significantly in the comparison neighbourhood (unadjusted OR 1.16 95% CI 0.60 to 2.26), but were reduced in the intervention area (unadjusted OR 0.52 95% CI 0.27 to 0.95). Respondents in the intervention area were significantly more likely to be in poor psychological health at baseline, but this difference had disappeared at follow-up.

In line with the analytic strategy employed for fruit and vegetable consumption and to generate a truer estimate of the effect of the intervention, Table 4 shows results adjusted firstly for differences in baseline health status (self-reported health or psychological health) between the two areas, and then baseline health status plus age, sex, education and economic activity. Comparing the intervention area with the comparison area the adjusted odds of having fair to poor self-rated health rose (OR 1.52, 95% CI 0.77 to 2.99) showing that the proportion of respondents with fair to poor self-reported health increased in the intervention area compared with the comparison area during the follow-up period. Conversely, the odds of having poor psychological health were reduced but were not statistically significant (OR 0.57, 95% 0.29 to 1.11). We also investigated potential interactions between confounding and outcome variables. For poor self-rated health there was a borderline statistically significant interaction with education ( $p=0.057$ ) and for psychological health a borderline statistically significant interaction with age

( $p=0.052$ ). There was little evidence for an interaction with educational status in the model for poor self-rated health ( $p=0.145$  for higher/further education/work based training and  $p=0.688$  for standard grade education). Similarly, age did not interact significantly in the model for psychological health ( $p$ -values ranged from  $p=0.260$  to  $p=0.982$ ).

*“Switchers”*: We then carried out an analysis which focused on comparisons between those respondents who reported “switching” their main food purchase to the hypermarket during the study with those that did not. The total number of respondents who switched and were available for this analysis was low ( $n=66$ ). Approximately half of the switchers changed from alternative superstores to the new hypermarket indicating that there was essentially no change in retail format utilised by some of this group. At follow-up, amongst the intervention group, 31% of respondents had switched their main food shopping to the new hypermarket.

Simple unadjusted bivariate analyses of change within each of the two groups (switchers and non-switchers) showed similar increases in fruit and vegetable consumption. Table 3 shows unadjusted and adjusted regression coefficients estimating the effect on fruit and vegetable consumption on all switchers (those in intervention and comparison sites) compared with non-switchers. Unadjusted analyses show a minor increase in fruit (0.16, 95% CI -0.19 to 0.50), vegetable (0.11, 95% CI -0.26 to 0.49) and fruit and vegetable (0.30, 95% CI -0.30 to 0.90) consumption in portions per day for switchers compared to non-switchers. However confidence intervals included zero indicating weak evidence of any effect. Adjusting for baseline consumption, age, sex, education, and economic activity attenuated the effects and they remained non-significant.

We tested for parallel regression lines in the ANCOVA model between switchers and non-switchers. In our model there is no evidence against the parallel line assumption for fruit consumption ( $p=0.08$ ), vegetable consumption ( $p=0.075$ ) and fruit and vegetable consumption combined ( $p=0.180$ ). Testing for linearity in the model, there was evidence for improvement in the model through introducing a quadratic term for mean vegetable consumption ( $p=0.042$ ) and mean fruit and vegetable consumption combined ( $p=0.012$ ) but not for mean fruit consumption ( $p=0.323$ ). For the latter two consumption measures this represents the final model (model 4). We can see that for switchers that there is a small improvement in mean fruit and vegetable consumption of 0.35 portions per day, though this is not statistically significant ( $p=0.335$ ).

We then considered the effect of the hypermarket on self-rated and psychological health. Table 4 shows unadjusted odds ratios and 95% confidence intervals for poor self-rated health and poor psychological health for switchers compared to non-switchers at follow-up. Unadjusted odds ratios for poor self-rated health showed improvements among switchers (OR 0.62, 95% CI 0.34 to 1.11). A larger reduction in poor psychological health (OR 0.81, 95% CI 0.41 to 1.58) was found, but both confidence intervals included 1.0, showing no statistically significant change.

As there were differences between switchers and non-switchers at baseline further analyses controlling for baseline health status were indicated, in addition to controlling for other confounding variable. After initial adjustment the odds of poor self-rated health improved to 0.69 (95% CI 0.35 to 1.42). Further adjustment for sex, age, education and economic activity reduced the odds further to 0.50, though this was not statistically

significant (95% CI 0.19 to 1.32). Adjustment for baseline psychological health status reduced the odds of poor psychological health for switchers to 0.42 (95% CI 0.19 to 0.92). Further adjustment reduced the odds ratio to 0.24 (95% CI 0.09-0.66) and the estimate remained statistically significant.

We then checked for interactions between the two general health outcomes and potential effect modifiers. There was no evidence for interactions with potential confounders for self-rated health. For psychological health there was some evidence for an age interaction ( $p=0.030$ ). Adding this as an interaction term to our logistic regression model did not give a statistically significant result ( $p=0.509$ ), and was thus not included in the final model (Table 4, Model 3). In summary, there is a good indication of a protective effect of the hypermarket on the psychological health of “switchers” (as assessed by GHQ score) compared to non-switchers. This improvement persists even after controlling for possible confounding variables.

### *Qualitative Focus Groups*

The qualitative research aimed to identify and describe the range of possible health and social impacts of the new hypermarket on local residents. It was hypothesised that the hypermarket may increase access to an adequate food supply, change food consumption patterns, and change indicators of social inclusion. For example, the new store may offer opportunities for participation in social networks, may change how residents perceive the local area, and these may in turn lead to changes in how residents see themselves as a community. In particular we were aware that the hypermarket was a ‘symbolic’ intervention, as well as a retail intervention; we therefore theorised that there may be for

example a reduction in negative social comparisons with other neighbourhoods, due to this highly visible large-scale commercial investment in a previously marginalised area.

*Physical access:* Issues of physical access were raised in relation to the hypermarket, but not in relation to local stores. Some respondents suggested that pedestrian access was difficult (via a busy road) and that it was better suited to a clientele with their own transport, as it was perceived to be situated on a relatively “edge-of-town” location. Many participants reported having no transport of their own, and that they travelled to and from Tesco on foot, by taxi or by bus. Some participants highlighted that the Tesco hypermarket is the only 24-hour alternative to the unfriendly approach adopted by filling stations: “*After eleven o’clock you cannae buy anything... ’Cos they don’t even let you into the petrol station.*” (66 year-old single man, retired, no children).

The crèche facilities offered by the store were seen as an important means of improving access; shopping with children was reported to be attention-consuming, and greater provision of reliable crèche facilities would allow parents to use the store.

Some participants raised the issue of boundaries and ownership. Although the hypermarket is located in the electoral ward of Springburn, local lay definitions of Springburn sometimes situated the store outwith those boundaries – that is, Springburn was sometimes defined with much narrower boundaries than those of the electoral ward. This may have implications for perceptions of accessibility and actual use of the new store.

*Availability:* In general the new Tesco was perceived to have increased the range of foods available locally. Participants reported a limited range in existing stores, and a wide range in Tesco, which some felt would encourage the purchase of novel items. Not all participants, however, were happy with this, reporting that they would be encouraged to shop beyond their means. Nor did they perceive the store as being particularly cheap: “*It’s no’ cheap, know what I mean? It’s... it’s the size of it ...by the time you’ve got round it, you’ve spent about three hundred quid for your messages*”. (30 year-old woman, unemployed, no children).

Perceptions of an increase in range were not shared by all. One respondent suggested that the focus was on luxury items, to the detriment of other products: “*For some things you can get what you would class as luxury items, do you know what I mean you’ll get a tin of mackerel fillets at £1.98 because it’s, what is it pink peppercorns sauce on it or something like that ... but they didn’t have tomato soup or chicken bloody soup, you know what I mean?*” (66 year-old single man, retired, no children)

Quality was not raised except in relation to local stores. Inhabitants felt that the local shops let them down over quality of produce. Shoppers felt that they did not wish to purchase fresh items in stores of questionable hygiene (i.e. the local stores). “*I’ll guarantee sixty percent of his stuff is oot o’ date*” (in reference to the local shop). (62 year-old married man, no children). “*I mean I don’t buy anything from the local stores here. I don’t buy any fresh fruit off them ‘cos I don’t like the look of it... it doesnae look clean, you know what I mean?*” (47 year-old unemployed single man, no children)

Many participants perceived Tesco to be relatively expensive, compared with local stores, and some people choose to shop in other stores because of this. Others were happy to pay extra in order to ensure quality of produce.

*Influences on Diet:* General issues of diet and health were raised spontaneously in some focus groups, and prompted by the facilitator in others, though the issue of the new hypermarket was not raised spontaneously in this context by any of the participants. Some participants felt that unhealthy, high-fat diets were, to a certain extent, generation-specific, with middle-aged people having eaten more high-fat foods in their youth as compared with young people: “*My husband had his first heart attack when he was 39 ... he died two years ago; he was 53 when he died ... when he was brought up, he always said that, you know, in these days it was a’ fried things ... aye, big fried breakfast, but he was a heavy smoker and a heavy drinker so he might have ended up so ill because of that.*” (50 years, female, employed, not alone, children.)

Although most participants felt that they ate healthily, perceptions of *other* people’s diets was that they were poor. (“*Springburn is less, definitely less healthy than it used to be*” (62 year-old single man, retired, no children)). One participant speculated that the reason for this change was the increasing number of take-away retail outlets (see Cummins et al 2005d, 2005e) and the availability of convenience foods in stores.

Particular mention was made of children’s eating habits. (“*Every time you see them they’re eating*” (33 year-old female parent)). Poor diet in children was attributed to peer and family pressures, and school influences. Other reasons suggested by way of explanation focused on available time and energy, on family demands upon parents, and

on access. Participants speculated that poor diets are also due, in part at least, to a lack of general understanding of the relationship between diet and health.

Participants did not report any change in diet as a result of Tesco's offering a wider range of foods than was available prior to its opening. They did, however, report a degree of enthusiasm for tasting new food in taster sessions carried out in the aisles of the new store. They reported, however, that it was unlikely that they would purchase items that they had tasted because the items used in taster sessions were perceived by respondents to be highly specialised lines, or were seen as relatively expensive items: "*The last time I was down, is was, em, blueberries! I mean how many people are going to go out and buy blueberries or things, know what I mean?! But that's what it was, it was blueberries they were trying to sell.*" (30 year-old female, employed, no children).

*Social Inclusion and Employment:* Participants reported that unemployment rates are high in the area, and that the new Tesco provided a much-needed boost in Springburn. Local residents also felt that Tesco was generous to the local community, unlike other stores which appeared to serve only themselves. For example, participants described Tesco's involvement in children's events, and in events to assist asylum seekers to integrate into Springburn: "*Well I have to say they[Tesco]'re quite good wi' our community like, we've asked them for donations for raffle prizes for the kids' Christmas party, things like that and they have never ever turned us down, they've always been really generous, you know, wi' us.*" (32 years, female, housewife, with children.)

Shops can also be used as social spaces and community meeting places, and so there is potential for the new store to act as a social venue. A few respondents reported using the

Tesco cafeteria as a social venue, but most report not using it (as a result of poor quality) or using it in a pragmatic way in conjunction with shopping trips.

### *The Retail Shop Count Survey*

Both areas were traditionally dominated by tenement streets with shops on the ground floor of the properties. During the early 1980s however a large part of the traditional streetscape in Springburn was demolished to make way for a new dual carriageway and a new covered shopping centre was built (Pacione 1982). The Springburn Shopping Centre contains a small Safeway supermarket (now Morrisons) and associated units. There is a number of other small convenience product stores (primarily food) spread across both areas. To the east of Springburn, Asda has a superstore at Robroyston. In Shettleston there is a Co-op supermarket in the main shopping area and Asda has a store nearby, at the Parkhead Forge to the west (see Cummins et al 2005d).

Shettleston (the comparison area) had, in 2001, more retail units than Springburn (the intervention area) with 293 retail units compared to Springburn's 186. Based on Census data (2001), the population of Springburn (32323) is higher than Shettleston (28779), but the number of retail units almost a third less. Despite this difference in provision however, the line of business analysis shows that the broad distribution of outlets is similar (Table 5).

Table 5 provides details of the change in the two areas over the survey period. By 2003, the broad structure remains similar in proportional terms in both areas. The direction of change has been the same in both areas, with the exception of comparison goods retailers (non-food), where there has been a decline in Shettleston (comparison area) and an

increase in Springburn (intervention area). There is a higher proportion of vacant units in Shettleston and a lower proportion of convenience units (i.e., food retailers) by 2003. Whilst the direction of change may have been the same, the magnitude is different. Service trades (i.e., hairdressers, tanning salons) have expanded more rapidly in Springburn and the proportion of vacant units has fallen faster there as well.

The absolute number of vacant units at October 2001 was higher in Shettleston, but in proportionate terms (a vitality indicator), the positions in Shettleston and Springburn were similar. The proportions diverged quite strongly after intervention (Figure 1). Initially, there was a decline in both areas, but this was not maintained in Shettleston. In Springburn, the rate has declined substantially, stabilising at a level lower than in Shettleston. The intervention area has produced a stronger performance in vacancy terms than the comparison area, possibly due in part to the regeneration effects of the new Tesco in Springburn.

## **Discussion**

*Summary of Quantitative Findings:* The analysis of the survey data suggests that, at the community level, though there were marginal positive increases in fruit and vegetable consumption within the intervention area, these increases were not statistically significant, after adjustment for other explanations. Self-reported health worsened, but psychological health improved in the intervention area (though again these changes were not statistically significant). Such conflicting findings are difficult to attribute to the new store; rather these may simply indicate changes in health status and well-being in both groups over time.

Among those respondents who were directly affected by the new store - the switchers – there was some indication of improvement in diet of up to 0.35 portions of fruit or vegetables per day though this was not statistically significant (though the small sample size meant that the analysis had limited power to detect a statistically significant subgroup effect). Although the number of switchers was low, about a third of the intervention group did switch to the new store for their main shopping. This suggests that the intervention did have an effect on the shopping patterns of a significant minority of shoppers. For general health measures there was a substantial improvement in switchers for both self-reported and psychological health, though this was only statistically significant with respect to change in psychological health in the sample.

There appeared to be some ‘absolute’ improvement in diet in the intervention area, when comparing data from the baseline and final surveys. Study designs utilising an uncontrolled “before-and-after” approach would have inferred this change at least in part to the new hypermarket. In our case the controlled study design showed that similar positive changes in fruit and vegetable consumption were also occurring naturally in the comparison area, suggesting that these improvements may simply reflect some wider change in diet over the year, possibly unrelated to the new store. One explanation for this may be that wider regeneration activities may have affected the general accessibility and availability of healthy food within the city food retail economy. Another candidate explanation is that fruit and vegetable consumption has been increasing over time in Scotland anyway (by 23% since 1998, according to data from NHS Health Scotland). The changes detected by our survey may simply reflect continuing temporal change in diet in our study areas, which tend to be the focus of related health improvement initiatives, such as action on cancer, cardiovascular disease and physical activity. A third

explanation is that these changes are due to other “overlapping” interventions, such as “Healthy Eating” campaigns, one of which was launched in 2001 and included distribution of some free fruit to Glasgow schools during the survey period.

Within the quantitative survey it is important to note that our approach, in common with many community based quasi-experimental studies in deprived areas, has a number of limitations. One of the main limitations of this study was the low response rate to the postal questionnaire, raising the possibility of selection bias. However, 2001 census data demonstrates that the age and sex distribution of our sample was similar to the age and sex distribution of the population from which the sample was drawn. The low total response limits our ability (through low statistical power) to detect statistically significant ‘true’ effects, and this is particularly relevant in the case of the switchers sub-group. Thus these findings must be treated with caution and as exploratory in nature.

Commentators might question the need to analyse respondent data at both the population level (data on all respondents from the intervention area) and at the sub-group level (data on switchers only) and suggest that the ‘switchers’ data is the only group that is truly of interest. This debate is analogous to the discussion about ‘intention to treat’ versus ‘on treatment’ analysis within epidemiological studies (Hollis and Campbell 1999). It is common epidemiological practice to analyse this kind of data by considering the original groups (in our case comparing change between intervention and comparison areas) to which respondents belonged – this is the equivalent of ‘intention-to-treat’ analysis. The contrary argument is that we are really only interested in those who are actually affected by the intervention itself (hypermarket switchers) which is equivalent to an ‘on-treatment analysis’. ‘On-treatment’ analyses may result in the over-estimation of the effects of

interventions (eg Bollini et al 1999, Hollis and Campbell 1999). In this study we felt that it is important to report both sets of analyses to ensure a balanced reporting of results and to explore the differences between general areal changes and those associated with shopping behaviour changes consequent on the intervention.

Reporting the results from both sets of analyses is also important for other, more policy orientated, reasons. With the current government's focus on what is essentially an area-based social policy programme, evaluation of what actually happens at the 'area' level is crucial. This has two important implications in the context of this research. Firstly, even though a disadvantaged area benefits from investment in its local retail economy (as advocated by current policy) it does not necessarily follow that residents, for various reasons, will take advantage of such investment. Secondly, as our study has indicated, it may be that even among those who do take advantage of improvements in the local retail economy, there is not that great an effect. It follows that if costly area-based social and health policy programmes cannot deliver benefits at the population level, then resources may well be better directed at high-risk groups of individuals (Curtis et al 2003).

*Summary of Qualitative Findings:* The issue of the hypermarket was not raised spontaneously in the focus groups, perhaps suggesting that there were limited impacts of the store on community life. The new store was not reported as having any direct impact on diet, though participants did comment positively when questioned on the range of produce available, the produce quality, and hygiene standards, compared with other local stores. This may reflect the fact that respondents did not perceive any direct links between diet and health, and shopping facilities. This in turn may suggest that there may be attitudinal barriers to access to healthy food. An alternative explanation is that the

focus group method may have inhibited some respondents from discussing these issues; participants may simply have not felt that the subject of the new store was relevant to a focus group discussion, which may have appeared (to them) to be concerned mainly with “health”.

The principal determinant of food selection was the range of foods on display, but produce quality, shop hygiene and cost were also highlighted as important influences. Respondents reported that the Tesco hypermarket now provides availability of a wider range of food than was previously present within the community (although not everyone agreed that this was advantageous to local residents). It did not, however, always appear ‘accessible’ in terms of cost, physical location, or transport of purchases.

There was some evidence of negative comparisons with other areas, but without any strong sense from the focus groups that the new store had redressed the balance. The only real, tangible benefits to the community seemed to come through mechanisms related to social inclusion: in particular the store’s interactions with the community, and the creation of several hundred local jobs were the most more relevant and obvious outcomes of the new store.

Perhaps this is not surprising. Influences on diet are complex and are unlikely to be revolutionised only by the inception of a large-scale retail outlet. They also take time to exert their effects. Our one-year post-intervention survey interval, whilst reasonable, might usefully be extended or surveys repeated to capture longer-term changes, though this runs the risk of diminishing responses and more confounding factors occurring.

There was no suggestion from respondents that the new store had had detrimental effects;

no reports, for example, of participants consuming larger quantities of relatively unhealthy foods compared to prior to its opening (though this was not an explicit focus of this study). The store remains just one of the many indirect influences on health within the wider community. However the focus groups did suggest that new large stores have the potential to shape food selection behaviours, and have real, direct impacts on employment.

*Summary of the Retail Shop Count Survey:* Based on a comparison beginning immediately before the opening of the intervention store, it may be concluded that the opening of Tesco in Springburn has not impacted negatively on its retail structure, and may have had some positive effects on vacancy rates. However, whilst the intervention and comparison areas may be similarly economically and socially deprived, they are in different stages of retail development. Despite a higher population, the intervention area has a lower number of shops, reflecting the re-development of the retail system over a period of decades, as relocation and concentration has occurred.

The effects of a store opening may be felt both before and after the actual date on which trading commences. No evidence of a wave of closures either before or after the opening could be isolated in Springburn however, suggesting limited impact. Only one small supermarket unit was empty at the beginning of the survey period. In the comparison area, the set of surveys was extended to capture the announcement of the future opening of another, (but smaller) Tesco store. In this case, the surveys have now bracketed the store opening more completely. Some anticipatory closure effects of the proposed opening are identified (Cummins et al 2005d).

Overall, the retail survey suggests that the intervention store has provided additional modern facilities for elements of the population. It would seem that with so little change in the retail structure in Springburn, particularly in the convenience section, availability has increased in absolute terms. Vacancy rates have fallen faster in Springburn, suggesting some general regeneration effects, though these can not solely be linked to the hypermarket development.

### **Conclusions**

The opening of a new Tesco hypermarket provided an opportunity to evaluate the impact of a large new food store in a deprived area, and thus meet Wrigley et al's (2003) call for further studies to replicate or extend their work and to continue to 'unpack' the 'food deserts' metaphor. The identification of significant positive or negative impacts would have provided important evidence for decision-makers advocating that new food retail outlets in poorer areas may importantly affect public health, and reduce health inequalities. The common assumption is that such large-scale interventions may increase availability and access to healthy foods. However, it might equally be argued that the opening of a new store may result in the closure of many other smaller shops in the area, with the net effect of *reducing* both access and diversity.

Our findings do not support either view. We have little evidence that the opening of a major new hypermarket has had a major effect on fruit and vegetable consumption; there were changes in the intervention area but these were similar in scale to those in the comparison area. The qualitative findings bear this out; on prompting, residents often pointed to impacts of the store on the community which were unrelated to retail activity; impacts such as supporting the community, and providing employment. The consumption

of fruit and vegetables by shoppers who did change to the new store (the “switchers”) changed little, though there was good evidence of improvement in psychological health in ‘switchers’, though causality must be interpreted with caution. ‘Switchers’ engage directly with the new development and thus may be more likely to perceive that the ‘area is getting better,’ and this may in turn affect their perceptions of health. Alternatively, those whose mental health improves, for whatever reason, may subsequently use the store more, simply because greater social participation is generally reflective of improved mental health.

Further corroboration of limited impacts is offered by the retail survey. The study the store had little effect on the number or type of shops in Springburn compared to Shettleston, though the vacancy rate did fall in Springburn. There is no evidence that the new store resulted in any restrictions in access to a healthy diet. The main potentially negative impact was the closure of the fish shop in Springburn, though this was ‘replaced’ by the fresh fish counter within the Tesco store. It has not been possible to ascertain whether this shop closure was directly attributable to the new store.

This is not to say that the new store has had *no* impact. The qualitative component of the study pointed to perceptions that Tesco was offering support to the community, and that this support was valued. This, and the impact of general visible investment in a deprived neighbourhood may result in improvements in local residents’ perceptions. The other impact signalled in the qualitative data is the provision of new jobs. The retail survey implies that few, if any, retail jobs were lost in the area after the opening of the new store. However about 450 new jobs were created, and more than 100 people on the New Deal programme secured work at the store. According to data from Tesco, these included

61 lone parents, 13 young people, 21 aged 50 or over, and 21 who had been out of work for two years or more. In all, 65% of store staff were previously dependent on benefits. We have no independent corroboration of this detailed data, or on the impact of these new jobs on the workers' health and wellbeing.

We conclude that (excluding the employment impacts) the net effect of the new Tesco hypermarket on health has been neither positive nor negative. It has not been detrimental to the community, in terms of the outcomes we have measured. Direct positive impacts on diet and health have however not been identified. The new hypermarket remains just one of the many influences on health within the community, and probably not the most important one.

Perhaps the most important finding from this study is that there was a similar degree of dietary change in both areas. This is important because the design of this study allowed the use of a "control group". Without this design we would not have been able to determine whether change was directly attributable to the new Tesco hypermarket. The only previously published study to examine the effects of a new store - the Leeds study (Wrigley et al 2003), did not employ a controlled design. Their study reported very similar positive effect sizes for fruit and vegetable consumption to those we found in Glasgow. They found an increase in mean consumption of fruit and vegetables of around 0.4 portions /day. The authors emphasised the policy importance of these findings, not least that

*"...a large-scale corporate intervention can significantly change shopping access...for large numbers of residents of such areas...our findings provide evidence of both direct and indirect positive impacts of the large scale-*

*intervention on the diets of some ... groups in the food desert.” (Wrigley et al., 2003)*

On the basis of our own findings we suggest that these data should be treated with more caution. In the absence of a similar comparison group it is not possible to determine whether the changes detected in the Leeds study are directly and solely attributable to the store, or to general changes in health behaviours in the wider community, or changes in other characteristics of the area.

However there are differences between the two studies that may affect interpretation; in particular general access to food in Springburn may have been better than in Seacroft (Leeds) prior to the intervention. Whilst a very deprived area, Springburn residents actually do have access to food, and this may explain the lack of any dramatic effect of the new store. In contrast, in an area where the new store replaces existing stores directly (on the same site) or where there is no real access to supermarkets or superstores, we might expect a greater effect. We are also aware that the survey response rates in our study are lower than those achieved in the Leeds study, reducing our statistical power to identify effects.

So where does this leave policy? The changes in health and diet we discerned were neither large nor causally linked to the development of the hypermarket. However inadequate retail access undoubtedly has an effect on the ability to purchase and consume suitable food products for an adequate and a healthy diet. Policy imperatives of improving availability and access would seem to be appropriate. This research however identifies access as a necessary but not sufficient condition for improvements in diet and health. Policy needs to ensure that the intervention in a deprived area does not consist of

a retail intervention alone, but considers wider aspects of health and diet education. This places us in agreement with White et al (2004). The research suggests that there may be benefits of introducing large new stores into an area in terms of the perception of the area and psychological health improvements. This large-scale retail intervention added to the retail structure of the area and appeared to have no net detrimental impact. Investment of this type, and with a retailer willing to engage with the local community would seem to bring benefits. However we do not have any evidence of the impact of competing policy alternatives such as community and small shop developments as originally envisaged by the Social Exclusion Unit (1998). As such we would not go as far as Wrigley et al (2003) in suggesting that because large store impact appears small, then small store impact would be even smaller. The social and other mechanisms around retail interventions would appear from our research to have local significance and it remains open as to the best methods of maximising these. However, we must not run away with the sometimes nostalgic view of independent small shops (APPSSG 2006). Independent local shops, as in this research, are often seen by residents to provide an inadequate service in terms of fresh food. Community shops are often, though not always, economically marginal and struggle for sustained existence. Policy to modernise retailing in deprived areas may have to focus on identifying the best local operational solutions possible and then maximising the benefits in retail and in social and health terms.

Given that spatial inequalities in retail food access and diet and health are highly variable, it is probable that different solutions will suit different neighbourhoods and areas. Ensuring local considerations are taken into account, given the rhetoric of ‘food deserts’, may be the biggest challenge of all.

## References

- APPSSG (All Party Parliamentary Small Shops Group) (2006) *High Street Britain 2015*. House of Commons, London. Downloaded from <http://news.bbc.co.uk/1/hi/business/4714572.stm> on 15 February 2006.
- Acheson, D. (1998) *Independent inquiry into inequalities in health*. London: The Stationary Office.
- Beaumont, J., Lang, T., Leather, S. et al (1995) *Report from the policy sub-group to the Nutrition Task Force: Low Income Project Team*. Institute of Grocery Distribution, Letchmore Heath, Watford.
- Bollini, P., Pampallona, S., Tibaldi, G., Kupelnick, B., Munizza, C. (1999) "Effectiveness of antidepressants. Meta-analysis of dose-effect relationships in randomised clinical trials". *British Journal of Psychiatry*, 174: 297-300.
- Cummins, S. and Macintyre, S. (2002a) "Food deserts" – evidence and assumption in health policy making. *British Medical Journal*, 325, 7361: 436-438.
- Cummins, S. and Macintyre, S. (2002b) A systematic study of an urban foodscape: the price and availability of food in Greater Glasgow. *Urban Studies*, 39: 2115-2130.
- Cummins, S., Petticrew, M., Sparks, L. and Findlay, A. (2005a) Do large scale food retail interventions improve diet and health? *British Medical Journal*, 330: 683 - 684.
- Cummins, S., Petticrew, M., Sparks, L., Findlay, A. and Higgins, C. (2005b) From steam engines to sunny delight. *Journal of Epidemiology and Community Health (Gallery)*, 59;1034
- Cummins, S., Petticrew, M., Sparks, L., Findlay, A. and Higgins, C. (2005c) Large-scale food retailing as intervention for diet and health: quasi-experimental evaluation of a natural experiment. *Journal of Epidemiology and Community Health*, 59; 1035-1040
- Cummins, S., Petticrew, M., Sparks, L. and Findlay, A. (2005d) Healthy Cities?: the impact of food retail led regeneration on food access, choice and retail structure. *Built Environment*, 31:4;288-301
- Cummins, S., McKay, L., Macintyre, S. (2005e) McDonald's Restaurants and neighbourhood deprivation in Scotland and England. *American Journal of Preventive Medicine*, 4:308-310
- Curtis, S., Cave, B., Coutts, A. (2002) Is urban regeneration good for health? Perceptions and theories of the health impacts of urban change. *Environment & Planning C: Government & Policy* 20:517-534
- Department of Health (1999a) *Reducing health inequalities: an action report*. London: Department of Health.

Department of Health (1999b) *Report of Policy Action Team 13: improving shopping access for people living in deprived neighbourhoods*. London: Department of Health.

Department of Health (2004) *Choosing health: making healthier choices easier*. White Paper on Public Health, November. CM 6374. London: Department of Health. Available for download from [http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT\\_ID=4094550&chk=aN5Cor](http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor)

Dibsdall, L.A., Lambert, N. and Frewer L.J (2002a) Using interpretative phenomenology to understand the food-related experiences and beliefs of a select group of low-income UK women. *Journal of Nutrition Education and Behaviour*, 34: 298-309.

Dibsdall, L.A., Lambert, N., Bobbin R.F. and Frewer L.J (2002b) Low-income consumers' attitudes and behaviour towards access, availability and motivation to eat fruit and vegetables. *Public Health Nutrition*, 6: 159-168.

Hollis, S., Campbell, F., (1999) "What is meant by intention to treat analysis? Survey of published randomised controlled trials", *British Medical Journal*, 319: 670-674.

International Journal of Retail and Distribution Management (2004) Special Issue – Extending the Food Desert Debate. *International Journal of Retail & Distribution Management*, 32, 2: 72-136.

McLoone P. (2004) Carstairs Scores for Scottish Postcode Sectors From the 2001 Census Glasgow: MRC Social and Health Sciences Unit, University of Glasgow.

NHS Health Scotland. Constituency health and well-being profiles 2004 – Springburn, Shettleston. Downloaded from [www.healthscotland.com/profiles](http://www.healthscotland.com/profiles) on the 10<sup>th</sup> June 2004.

O, Neill M (2005) *Putting Food Access on the Radar*. London: National Consumer Council.

Pacione, M. (1982) Retail redevelopment in the inner city: a case study of Springburn, Glasgow. *Scottish Geographical Magazine*, 98, 3: 166-179.

Parry, O., Bancroft, A., Gnich, W. and Amos, A. (2001) Nobody home? Issues of respondent recruitment in areas of deprivation. *Critical Public Health*, 11: 305-317.

Social Exclusion Unit (1998) *Bringing Britain together: a national strategy for neighbourhood renewal*. London: Stationery Office.

Social Exclusion Unit (2000) *National strategy for neighbourhood renewal: policy action team audit*. London: Cabinet Office.

Tesco Stores Ltd (2002a) *Tesco Regeneration Partnerships Evaluation report 07:99-06:02 - the story so far*. Tesco Stores Ltd, Cheshunt

Tesco Stores Ltd (2002b) *Tesco Regeneration Partnerships - the story so far*. Tesco Stores Ltd, Cheshunt

Urban Studies (2002) Special Topic: 'Food Deserts' in British Cities. *Urban Studies*, 39, 11: 2029-2130.

Wanless, D. (2004) *Securing good health for the whole population*. Report for HM Treasury. Available for download from [http://www.hm-treasury.gov.uk/consultations\\_and\\_legislation/wanless/consult\\_wanless04\\_final.cfm](http://www.hm-treasury.gov.uk/consultations_and_legislation/wanless/consult_wanless04_final.cfm)

White, M., Bunting, J., Williams, L., Raybould, S., Adamson, A., Mathers, J. (2004) Do 'Food deserts' exist? A multi-level, geographical analysis of the relationship between retail food access, socio-economic position and dietary intake. Project Report N09010, available from the Food Standards Agency.

Wrigley, N. (2002) 'Food deserts' in British cities: Policy context and research priorities. *Urban Studies*, 39, 11: 2029-2040.

Wrigley, N., Guy, C. and Lowe, M. (2002a) Urban regeneration, social inclusion and large store development: The Seacroft development in context. *Urban Studies*, 39: 2101-2114.

Wrigley, N., Warm, D., Margetts, B. and Whelan, A. (2002b) Assessing the impact of improved retail access on diet in a 'food desert': A preliminary report. *Urban Studies*, 39: 2061-2082.

Wrigley, N., Warm, D. and Margetts, B. (2003a) Deprivation, diet and food retail access: findings from the Leeds 'Food Deserts' study. *Environment and Planning A*, 35, 151-188.

**Table 1: Baseline Respondent Characteristics**

<b>Variables</b>	<b>All N (%)</b>	<b>Comparison area* N (%)</b>	<b>Intervention area* N (%)</b>
<b>Sex</b>			
Male	118 (28.64)	57 (25.90)	61 (31.77)
Female	255 (61.89)	142 (64.55)	113 (58.85)
Missing	39 (9.47)	21 (9.55)	18 (9.38)
<b>Age</b>			
16-24	6 (1.45)	2 (0.91)	4 (2.08)
25-34	62 (15.05)	21 (5.10)	41 (21.35)
35-44	57 (13.83)	28 (6.80)	29 (7.04)
45-54	63 (15.29)	35 (8.49)	28 (6.80)
55-64	58 (14.08)	36 (8.74)	22 (11.46)
65+	75 (18.20)	45 (10.92)	30 (15.63)
Missing	91 (22.09)	53 (12.86)	38 (19.80)
<b>Economic Activity</b>			
Active	123 (29.85)	71 (32.27)	52 (27.08)
Inactive	251 (60.92)	128 (58.18)	123 (64.06)
Missing	38 (9.22)	21 (5.10)	17 (8.85)
<b>Education</b>			
Standard Grade	162 (39.32)	92 (41.82)	70 (36.46)
Highers/work based further training	138 (33.50)	71 (32.27)	67 (34.90)
Higher Education	32 (7.77)	20 (9.09)	12 (6.25)
Missing	80 (19.42)	37 (16.82)	43 (22.40)
<b>Fruit &amp; Veg (5+)</b>			
Fruit & Veg (5+)	152 (37.53)	86 (39.09)	66 (35.68)
<b>GHQ-12 (4+)</b>			
GHQ-12 (4+)	119 (32.16)	53 (26.63)	66 (38.60)
<b>Poor self-rated health (excludes missing values)</b>			
Poor self-rated health (excludes missing values)	141 (39.17)	78 (40.41)	63 (37.72)

\*Z-tests to compare these proportions suggest that none of the differences between the areas are statistically significant (p=0.05)

**Table 2: Key outcomes in intervention and control communities, pre and post intervention and magnitude of change.**

Outcome	Intervention community			Control community		
	Pre-intervention	Post-intervention	Change	Pre-intervention	Post-intervention	Change
Diet *						
<i>Fruits (portions/day)</i>	1.97	2.06	0.09 (p=0.35)	2.11	2.23	0.12 (p=0.19)
<i>Vegetables (portions/day)</i>	2.06	2.21	0.15 (p=0.14)	2.16	2.41	0.25 (p=0.01)
<i>Fruits and vegetables (portions/day)</i>	3.92	4.21	0.29 (p=0.07)	4.16	4.60	0.44 (p=0.003)
Health **						
<i>Fair-to-poor self-reported health (prevalence)</i>	37.7	45.05	7.35 (p=0.17)	40.41	38.94	-1.47 (p=0.76)
<i>Poor psychological health (prevalence)</i>	38.6	26.47	-12.13 (p=0.017)	26.63	25.79	-0.84 (p=0.85)

\*T-test for difference in means

\*\*Z-test of two proportions

**Table 3: Intervention effect estimates (95% confidence intervals) for fruit, vegetable, fruit and vegetable consumption in portions per day for intervention compared to comparison community and for ‘switchers’ compared to ‘non-switchers’.**

<b>Outcome</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
	<b>Unadjusted</b>	<b>Adjusted for baseline</b>	<b>Model 2 adjusting for sex, age, employment and education</b>	<b>Model 3 plus a quadratic term</b>
<i><b>Intervention Community</b></i>				
Fruits	-0.19 (-0.44 to -0.05)	-0.10 (-0.32 to 0.12)	0.03 (-0.25 to 0.30)	-
Vegetables	-0.21 (-0.48 to 0.06)	-0.16 (-0.42 to 0.10)	-0.11 (-0.44 to 0.22)	-0.11 (-0.44 to 0.22)
Fruits and vegetables	-0.44 (-0.86 to -0.01)	-0.28 (-0.67 to 0.11)	-0.10 (-0.59 to 0.40)	-0.10 (-0.59 to 0.40)
<i><b>Switchers</b></i>				
Fruits	0.16 (-0.19 to 0.50)	0.09 (-0.21 to 0.40)	0.23 (-0.15 to 0.60)	-
Vegetables	0.11 (-0.26 to 0.49)	0.00 (-0.36 to 0.36)	0.09 (-0.36 to 0.54)	0.12 (-0.33 to 0.57)
Fruits and vegetables	0.30 (-0.30 to 0.90)	0.15 (-0.39 to 0.69)	0.35 (-0.33 to 1.03)	0.35 (-0.32 to 1.02)

**Table 4: Odds ratios (95% confidence intervals) of reporting fair to poor self-reported health and poor psychological health for the intervention compared to comparison community and for ‘switchers’ compared to ‘non-switchers’**

<i>Outcome</i>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
	<b>Unadjusted odds ratio</b>	<b>Odds ratio adjusted for baseline outcome</b>	<b>Odds ratio adjusting for model 2, sex, age, employment and education</b>
<b><i>Intervention Community</i></b>			
Fair to poor self-rated health	1.29 (0.86 to 1.93)	1.55 (0.93 to 2.62)	1.52 (0.77 to 2.99)
Poor psychological health	1.04 (0.65 to 1.66)	0.81 (0.48 to 1.38)	0.57 (0.29 to 1.11)
<b><i>Switchers</i></b>			
Fair to poor self-rated health	0.62 (0.34 to 1.11)	0.69 (0.35 to 1.42)	0.50 (0.19 to 1.32)
Poor psychological health	0.81 (0.41 to 1.58)	0.42 (0.19 to 0.92)	0.24 (0.09 to 0.66)

**Table 5: Retail Change in Springburn and Shettleston, 2001-2003 (number of shops)**

	Springburn October 2001	Springburn October 2003	Percentage Change 2001-2003	Shettleston October 2001	Shettleston October 2003	Percentage Change 2001-2003
Convenience	67	65	-3.0	94	90	-4.3
Comparison	29	30	3.4	52	49	-5.8
Service	58	70	20.7	100	110	10.0
Vacant	32	21	-34.4	52	44	-15.4
Total	186	186	0	298	293	-1.7

**Figure 1: Vacancy Rates in Springburn and Shettleston, 2001-3**

