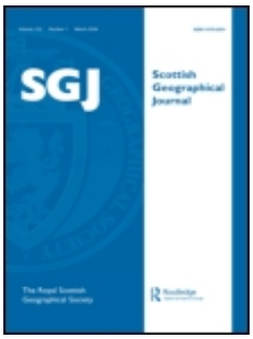

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Food Deserts in Dundee

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ABSTRACT *The poor health of Scots is sometimes linked to poor diet, especially a lack of fresh fruit and vegetables. However, this lack may itself be linked to accessibility issues. In recent years, shops selling 'healthy' food, such as large superstores, have tended to relocate to edge-of-town locations, which are very accessible to car users but difficult for others. The term 'food desert' is often applied to inner cities when they have few or no food shops, or at least few shops selling healthy food. This paper describes a project intended to evaluate the applicability of the food desert concept to Dundee, Scotland's fourth largest city (2001 population 145,663), located on the Tay estuary in East Central Scotland.*

A postal survey was conducted in Dundee in the summer of 2009. It collected information on consumption of fresh fruit and vegetables, and of other supposedly healthy (or unhealthy) foods, the retail outlets most often used for food purchases, the mode and duration of food shopping trips, and whether respondents found it easy or difficult to shop for healthy food. Although the response rate in some zones was poor, it is possible to identify some clear trends in the data. The failure of 81% of respondents to eat the recommended five portions of fresh fruit and vegetables per day confirms that dietary choices are problematic for Dundonians. The sample overall showed that the majority of food shoppers went by car, and that journeys seldom lasted more than 20 minutes. Very few respondents said that they found shopping trips difficult.

In view of these results, it does not seem appropriate to describe Dundee as a food desert, though many individuals may settle for a less healthy diet because of difficulties in gaining access to more healthy foods. Dundee may be too small to be a food desert. Residents in all our survey areas are within easy reach of at least one superstore. However, the lack of support for the 'food desert' metaphor should not be interpreted as meaning that nobody experiences problems of accessibility to healthy food, nor that individuals' illnesses should be blamed on their poor food choices.

KEY WORDS: food deserts, access to healthy food, Dundee, shopping survey, diet

Introduction

There have been major changes in the geography of food retailing since the 1980s, many of them being a result of increasing size of supermarkets and of increasing concentration of food retailing in the hands of a small number of companies. The need for a large site with plenty of space for parking has meant that many branches

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in city centre locations have closed down to be replaced by new spacious edge-of-town retail parks. This increases their competitiveness because an increased market share of the majority car-using shoppers outweighs the loss of business from the minority without cars. For those shoppers who go by car, this is probably a positive change; for those without cars it will usually be negative, making shopping trips longer or perhaps necessitating a change to an inferior but closer food shop.

In the early 1990s the term 'food desert' was coined (see Cummins & Macintyre, 1992) to describe parts of a city where residents did not have adequate access to food shops. In Scotland, the alleged food deserts have been linked to the poor Scottish diet (and consequently poor health: see Sooman *et al*., 1993). It has been quite a long time since the food desert metaphor was first developed and it is now important to consider what the term can contribute – if anything – to our understanding of healthy food access today. A further complication is the growing tendency of retailers to open small 'express' stores in central locations (BBC, 2010). Indeed, it should be noted that since the time of conducting fieldwork a Tesco express store has opened near the centre of Dundee.

This article explores the notion of the 'food desert' by conducting a study of access to food shops in a Scottish city. The empirical approach provides data through which it is possible to analyse the factors hindering people's ability to consume a wide range of healthy food. This is an important topic to research given the drive by government to encourage healthy eating. In particular, it is an important topic for geographers to address because the geographical approach can provide direct insights into the spatial aspect of food access.

In order to answer questions such as these, the study took a mixed methods approach (Bryman, 1988) to studying food access in the city of Dundee, Scotland in the summer of 2009. This included a postal questionnaire which was intended to generate representative quantitative data. It also gave respondents the chance to express their own ideas, opinions and individual experiences. Many of these are quoted below, with a reference to the study area they came from.

These data are supplemented with information about related topics such as the changing distribution of supermarkets in Dundee and the city's social geography, which provide the context for analysis of the journey to shop in Dundee, and how this relates to the food desert metaphor.

The city of Dundee was selected because, as far as we are aware, it has not been the subject of a published 'food desert' study, because its working-class heritage suggests prices may be more important than quality in determining food purchasing, and because our own observations suggested there might be a mismatch between outer districts well provided with large supermarkets and inner city areas which appear relatively deprived. Given the limited resources available to this study, the distribution of the questionnaire was restricted to six contrasting areas within Dundee. Essentially food access in three more deprived areas is compared with access in three less deprived areas.

In this paper, we examine the appropriateness of the food desert metaphor and argue that evaluation of the effects of recent changes in the geography of contemporary retailing requires an examination of the many factors which can influence food access. These include individual attitudes to food quality and healthy eating, as well as geographical location and the cost and availability of transport.

It became clear during the study that it is more appropriate to talk about questions of 'food access' rather than simply labelling areas as 'food deserts'. Talk of access enables us to consider the many barriers, both physical and social, which may limit people's ability or will to eat healthily.

Previous Work on Food Deserts

It is 16 years since a UK government report first used the term 'food desert' (Beaumont *et al*., 1995). The metaphor is used to describe the difficulties that residents in deprived neighbourhoods may have in accessing food items (Cummins *et al*., 2008), particularly a wide selection of healthy foods. It is not just a British phenomenon; a similar problem can be identified in the United States (Nayga & Weinberg, 1999) and other developed market economies. As evident from the publication of a collection of articles about food deserts in a prominent journal (*Urban Studies* 2002 (11)), introduced by Neil Wrigley, there has been considerable academic interrogation of the accuracy of this contentious term. Shaw (2010) has provided a substantial on-line bibliography.

Before the study of food deserts began in the mid 1990s, there was relatively little work in the geography of retailing from the perspective of the consumer. Notable exceptions include Guy's work (1985) and the review article by Westlake (1993). Indeed, geographers tended to focus on issues such as store location and on the retail market itself (e.g. Wrigley, 1988; Jones & Simmons, 1990), both very much from the perspective of the retailers. The study of food deserts in the discipline signifies a turn towards analysing the consumer's perspective. This change of focus reflects the re-emerging significance of social justice within geography (Johnston *et al*., 2000). Indeed, the analysis of food access in deprived neighbourhoods is an important weapon against the 'blaming the victim' argument which attributes the health inequality present in society to the failure of the deprived people themselves to follow medical advice on diet. This argument is clearly weakened if the deprived live in a 'food desert' and cannot buy the recommended foods.

The concept of the food desert proved popular with the media although it was based on only a small number of academic studies into food access. Reports by the BBC (1998) and *The Guardian* (1999) are evidence of the momentum that this discourse was gathering but it should be remembered that the media reports were based on information from the British government. This is particularly evident in the BBC (1998) article. There was also support for the term from studies undertaken in the early 1990s in Glasgow and in London (Sooman *et al*., 1993; Mooney, 1990). These were small-scale studies but did spark debate about food access in disadvantaged areas of British cities.

More recently there has been some further support of the concept as evident from two major studies. Firstly, Clarke *et al*.'s (2002) study in Cardiff, Leeds and Bradford concludes by identifying several areas which can be considered as food deserts. This quantitative approach uses mapping and modelling to evaluate food retailing patterns, and goes as far as to suggest that policy should not consider supermarkets as the solution to poor food access. There is also support for the concept from Ball *et al*.'s (2009) study in Melbourne, Australia, which found that residents in deprived areas needed to travel a greater distance to reach supermarkets and fruit and

vegetable stores. Although this study does not specifically use the term 'food desert' it is important within this field because it shows that it may be difficult to access healthy foods in some areas. However, the authors do qualify their results by noting that access and price may not be the key reasons for differences in the amount of fruit and vegetables people consume. Both studies show that there has been some support for the existence of food deserts in recent years.

Despite this support, there is a large body of research which calls the concept of the food desert into question. This work can be divided into the categories of quantitative studies, qualitative studies and political approaches taken. In the first of these quantitative studies, Apparicio *et al.* (2007) found that food deserts are not a significant problem in Montréal and conclude that the policy focus should move away from simply examining where supermarkets locate. An interesting study by Pearce *et al.* (2009) assessed whether access to fast-food outlets is related to diet. Again the authors do not specifically use the term 'food desert'. They found that access to nearby fast-food restaurants is not linked either with being overweight or with eating the advised number of fruit and vegetable portions. Smoyer-Tomic *et al's* (2006) study in Edmonton, Canada, actually finds that people in areas considered as 'high-need' mostly had better access to supermarkets than people living in other areas of the city.

Additionally, there has been some important quantitative work published by the UK Food Standards Agency (Nelson *et al.*, 2007) and the Office for Science (Butland *et al.*, 2007). These government reports both point to the multi-faceted drivers of health concerns, such as obesity (in the Butland *et al.*, 2007 report). Reading these reports highlights that there are many complex factors that can drive health outcomes, including psychological and social factors. Hence, it would seem from this wealth of quantitative data that applying the 'food desert' metaphor may actually obscure the complexities of food access today. Thus further doubt is cast on the appropriateness of the term.

There are also some qualitative studies which take a more nuanced approach to studying food access. For example, Convey and O'Dwyer's (2009) study in Adelaide, Australia, uses interviewing to find out that social networks such as those which allow access to private transport are more important than the distance between home and shops for some people. This is interesting because it shows that geographical distance is not the sole determinant of whether healthy food is accessible to people. Another paper, by Whelan *et al.* (2002), shows that different factors are more important to specific groups of people in accessing healthy foods. This is evident from the focus group results of women with young children for whom cost is extremely important in deciding where to buy food. Elderly people may also have specific but different constraints on their shopping behaviour. So may disabled people.

Both of these studies stress that it is important to think about social factors when studying food access. We should consider access to healthy foods for different groups of people. Raja *et al.* (2008) also argue that it could prove important to focus on race as determining varying degrees of food access. For some minority groups, religious factors may lead to encouragement or discouragement of certain food items, or to a requirement that foods be prepared in a certain way. This could create extra access problems for shoppers constrained to buy halal or kosher food. However, there has not been much research in this area. There may also be a case for smaller shops as well as supermarkets (Short & Guthman, 2007). This provokes us to think about

how food access can be improved, whether it be by building more supermarkets or having more smaller shops. Finally, there is evidence to suggest that we need to think about more specific aspects of health rather than simply taking a general approach. Cummins *et al*'s (2008) study in the Springburn area of Glasgow found that building a new hypermarket resulted in just a small increase in fruit and vegetable consumption but there was also a significant improvement in psychological health. It is not clear what exactly caused this improvement, but it may be valuable for research to recognise that different aspects of health may be affected differentially.

To conclude this review, there are several studies which we can look at to find evidence for the fact or fiction of the existence of food deserts. Instead of trying to confirm or disprove their existence, it is now necessary to move towards a more nuanced approach to studying food deserts. This includes evaluating access for different groups of individuals, something which this research will attempt for the case of Dundee.

Research Questions

This paper seeks to investigate:

1. how far people in Dundee have been affected by recent changes in the geography of retailing,
2. the extent to which Dundee residents do have a healthy diet and how that differs between people and social groups,
3. how far poor diet can be attributed to problems in accessing healthy food,
4. how these findings differ between different parts of Dundee, and
5. whether it is sensible and useful to apply the term 'food desert' to parts of Dundee.

These questions are answered from a postal survey of Dundee undertaken in summer 2009.

Food Retailing in Dundee

A simple way of looking at the changing retail structure of Dundee is to compare Yellow Pages entries under the heading 'supermarkets' for different years. There are of course definitional problems, but those listed in the DUNDEE 00/01 volume include Dundee locations for the following national and international companies:

- Asda, Derwent Avenue
- Asda, Milton of Craigie Road
- Kwik Save, Albert Street
- Kwik Save, Lochee
- Safeway, Arbroath Road
- Safeway, Broughty Ferry
- Tesco, Riverside
- Tesco, Lochee

- Tesco, Kingsway
- Tesco, Murraygate

Since then, Kwik Save has gone out of business, and Safeway has been taken over by Morrisons.

Tesco has closed its inner-suburban Lochee store, housed in a disused jute mill, while continuing to develop edge-of-town stores, such as South Road. Additions to the Supermarkets list since 2000 include:

- Farmfoods, Lochee
- Lidl, Dura Street
- Lidl, Lochee
- Marks & Spencer
- Morrisons
- Nisa, Perth Road
- Sainsburys
- Somerfield
- Tesco, South Road

Of these locations, Murraygate is in the city centre (as is Marks & Spencer) and Lochee, Dura Street and Albert Street are in high-density inner suburbs, while Riverside, although fairly close to the centre, cannot easily be reached from many places without a car. Most of the others are in edge-of-town locations. Figure 1

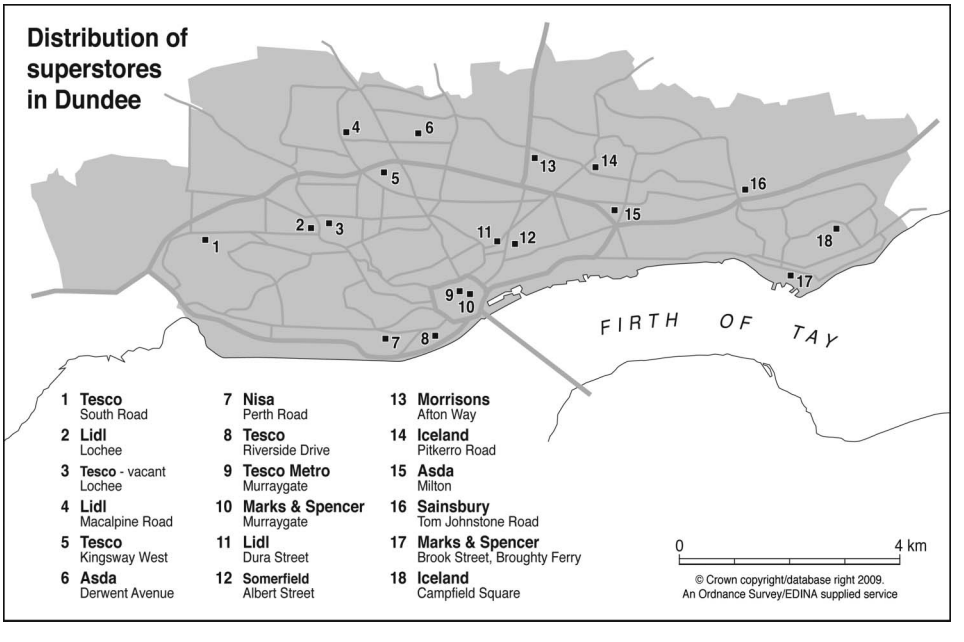

Figure 1. Location of major superstores in Dundee

shows the location of Dundee's largest supermarkets. Note the predominance of outlying stores, especially to the north-east.

It is the smaller chains, and many others in local ownership (see also the listings under 'Grocers & convenience stores'), which might be expected to find it difficult, first, to maintain a good supply of healthy fresh foods for their customers, and, second, to survive at all. There are also, of course, a few specialist greengrocers and butchers in the inner suburbs whose businesses are also suffering from competition from the large edge-of-town supermarkets (Tescopoly, 2010).

The Dundee Planning Department has been concerned with monitoring trends in retailing and setting retailing policy (Dundee City Council, 2007). Its main aims have included support for retailing in the city centre and maintaining access to food shops, especially for poorer neighbourhoods. Nevertheless it has not been able to stop new supermarkets locating in edge-of-town sites.

Investigating Attitudes to Food Shopping in Dundee

In order to gauge how people in Dundee feel about their access to food shopping, a short questionnaire was devised to examine Dundee residents' shopping behaviour and attitudes. Rather than attempting to draw a sample from the whole of Dundee, six neighbourhoods were chosen to represent the range of conditions within the city (see Figure 2). Three relatively prosperous areas (Broughty Ferry West, Perth Road and Baxter Park) and three relatively deprived areas (Whitfield, Hilltown and Lochee) were chosen. The last three all include land which has been awarded

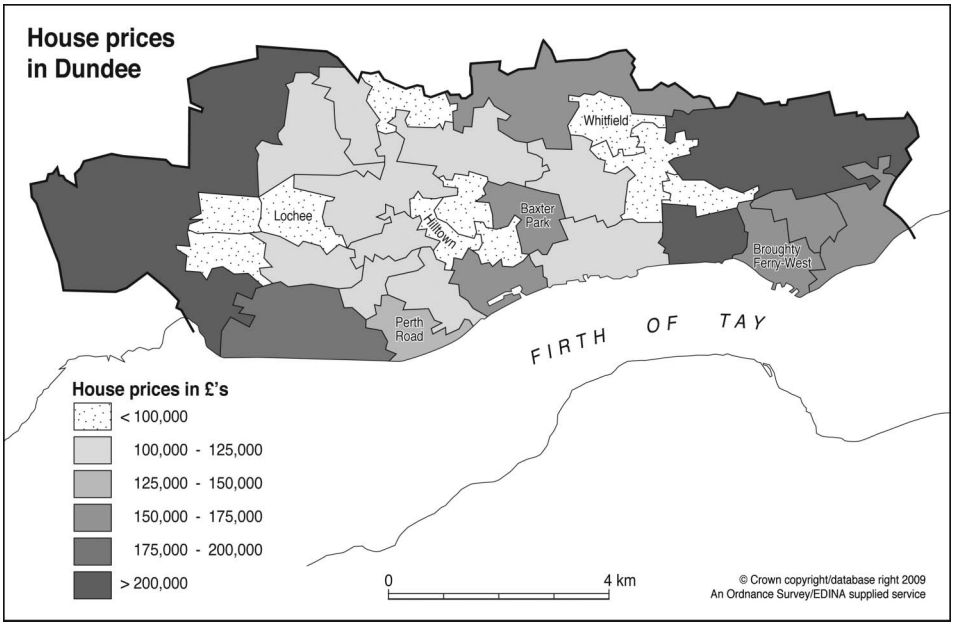

Figure 2. Median house prices by areas of Intermediate Geography in Dundee. *Source*: Scottish Neighbourhood Statistics

community regeneration status. All six areas can be identified with areas of intermediate geography (IG) as defined by Scottish Neighbourhood Statistics (SNS); these areas typically have populations between 2500 and 6000.

One indicator of area prosperity or the reverse is the median sales price of housing in the area. This information, with much else, is available from Scottish Neighbourhood Statistics at the IG level. By ranking the IG areas according to median house price, the relative prosperity of the six study areas can be put in context; house prices are for 2008. Of the 31 IG areas in the City of Dundee, median house prices ranged from West Ferry (£218,322) to Douglas West (£78,731). The house price data confirm that our six study areas represent contrasting degrees of prosperity, Broughty Ferry West (£158,230), Baxter Park (£152,466) and Perth Road (£134,223) all being fairly high, and Whitfield (£81,108), Hilltown (£82,444) and Lochee (£99,935) all fairly low. However, the study areas differ in other respects. Lochee was a small independent settlement that became merged with Dundee as the latter grew; Perth Road was the main commercial transport artery running through the high status western sector; and Hilltown has lower-status housing and commercial development. Baxter Park is an old established gentrifying area; Broughty Ferry West is part of the wealthy suburb downriver from the city centre; and Whitfield is a large peripheral council housing estate.

The questionnaire was sent to 100 addresses in each of the six areas, selected by systematic random sampling. A postal survey was chosen because of the time that would be required to conduct personal interviews, despite the expectation of a low response rate from this method, and the likelihood that there would be a response bias. Indeed, the total response rate was 29.5% (see Table 1), varying between 19% (Whitfield) and 43 % (Baxter Park).

The questionnaire is mainly based on categorical variables and hence chi-squared tests are the most appropriate technique for reporting the results. However, there are many variations possible in how these tests are applied, based on how categories of some of the variables are omitted or aggregated in order to avoid the problem of low expected values. This issue is treated in many statistics texts, Lovett (2005, 209–215) providing a non-technical overview. We also wish to avoid presenting large numbers of tables and statistical tests on the grounds of excessive length and complication. We have only presented those tables which seem relevant to our research questions, and we have only quoted chi-squared significance tests where the existence or otherwise of a relationship is not obvious.

The majority of respondents (70%) were female, though there were differences between areas, Hilltown, Broughty Ferry West and Lochee having a slightly higher

Table 1. Study areas, their median house prices and response rates

Study area	Median house price (£)	Total responses (out of 100)
Whitfield	81,108	19
Lochee	99,935	25
Hilltown	82,444	30
Broughty Ferry West	158,230	32
Perth Road	134,223	28
Baxter Park	152,466	43

proportion of male respondents. The age distribution of respondents is fairly even across all adult age cohorts with 11% aged 25–34, 16% aged 35–44, 20% aged 45–54, 22% aged 55–64, 14 % aged 65–74, and 12% aged 75 and over. The main exception is the 18–24 age group, who made up less than 3% of respondents.

Family and household structure may be relevant to food shopping needs. Just under half of the respondents (47%) were married, with 22% being single, 3% separated, and surprisingly many divorced (11%) or widowed (12%). The percentage of respondents in single-person households was 32%, with 41% in two-person households and only 14% in households with more than three members. Most of the households in the survey (76%) did not contain any children aged 16 or under; 15% included only one such child; and only 6% had the traditional structure of a couple with two children. People in Hilltown were more likely to be living in single-person households than those in Whitfield.

The main source of household income for survey respondents was paid employment (52%), with 30% of respondents saying that pensions were their main income source, followed by 7% on government benefits and less than 2% on student loans. Perth Road had the highest percentage with paid employment (70%), and Baxter Park (41%) and Broughty Ferry West (38%) had the highest percentages with pensions. The level of income and its sources may well influence food purchasing behaviour.

Respondents were also asked to rate their physical health on a scale from 1 (very poor) to 5 (very good). Very few people selected either of the bottom two categories, but grouping 'neutral', 'quite poor' and 'very poor' together produced a cross-tabulation with IG zone that generated a chi-squared statistic significant at the 0.011 level. Respondents in Whitfield appeared to be the least healthy, and Broughty Ferry West the healthiest. A similar question was asked about mental health. Again, very few people selected 'quite poor' (2) or 'very poor' (4). Lochee seemed to have slightly worse mental health than the other IG areas, and Baxter Park slightly better.

It is well known (e.g. Valentine, 2005) that fixed questionnaires do not always allow respondents to describe the context and significance of the topic to them. Accordingly space was provided on the questionnaire for respondents to add additional comments. Many useful comments were made and are reported in the appropriate sections below.

Choosing Where to Shop

The concept of lack of access to food shopping can be regarded as having a strong and a weak sense. The strong sense implies that it is difficult to buy any food at an accessible location; the weak sense implies that it is difficult to buy suitable food at an accessible location. What food is regarded as 'suitable' will vary between people and cultures. The strength of the 'healthy diet' lobby is such that many will rate the perceived healthiness of food as the dominant reason for selecting it (see the comments below).

> Given the range of supplies on offer now there is no excuse not to have a healthy diet, even on a low budget. (624, Baxter Park)

> Fruit + veg + various healthy foods are available at discount prices within the area, which is often the reason cited for not eating healthily and I would suggest that a lack of affordability is a fallacy and that the most important influencing factors are knowledge and attitude. (212, Lochee)

Others will consider taste preferences as more important (both the shopper's and each household member's), or preparation time, or cleanliness, not to mention price. Our question asked respondents to select the three most important reasons (out of 10 suggestions) for choosing which shop to buy most of their food from. Answers are shown in Table 2, disaggregated by IG area.

Questionnaire respondents also provided some interesting qualitative data to explain the way they shop and eat:

> It is difficult to find healthy food locally which is as fresh as the supermarkets and also value for money. I would use local shops more, but can't due to working hours. (110, Whitfield)

> My home is situated close to three supermarkets all only 10 minutes drive away. (217, Lochee)

> It's not so difficult to buy healthy food, it's more a time element . . . it is difficult to have time to cook a healthy meal. (506, Perth Road)

> Transport is a problem, also the local shops are more expensive, but more vulnerable people go there for convenience. (110, Whitfield)

For the sample as a whole, location was most often chosen as one of the most important attributes. Quality also was widely selected. Having a selection of healthy foods was the third most popular attribute, It is clear that people in the less deprived study areas were significantly more likely (according to chi-square at the 0.05 level) to care about the healthiness of food they buy in comparison to the more deprived areas, especially Hilltown. In partial contrast, respondents in the latter areas were more likely to choose cheapness as an important consideration (Hilltown respondents significantly more so than the other five areas according to chi-square at the 0.05 level).

Table 2. Study areas and reasons for choosing where to shop

Attribute (% for IG area)	Whitfield	Lochee	Hilltown	Broughty Ferry W	Perth Road	Baxter Park	Total
Cleanliness	12	29	39	32	19	42	31
Cheap prices	35	38	54	23	33	32	35
Location	53	42	57	74	70	63	61
Friendly staff	12	25	7	16	11	16	15
Healthy food	29	33	21	48	48	34	36
Reputation	29	17	14	23	11	18	18
High quality	53	58	29	48	37	45	44
Disabled access	0	4	4	0	4	3	2
On bus route	24	17	29	3	11	3	13
Food deliveries	6	0	0	0	15	5	4

> It is difficult for people to buy healthy food in this area because a lot of people suffer from poverty so they buy the cheapest and easiest foods. (201, Lochee)

'Friendly staff', perhaps surprisingly, was not often chosen in any area, and very few people selected those attributes which might be particularly useful for people with access problems – disabled access, bus routes and deliveries. The low numbers in each of these last three categories are perhaps due to the dominance of the car in journeys to shop and the low numbers of respondents claiming to have poor physical health. When asked about their transport mode on shopping trips, the vast majority were car drivers (57%) or passengers (14%) with 15% walking and only 12% going by bus. Journeys by bus were virtually confined to respondents in the more deprived IG areas, especially Hilltown and Whitfield:

> Easy bus access to supermarkets i.e. Asda and Sainsburys. (109, Whitfield)

> Superstores like Tesco, Asda and Morrisons build stores away from the poor people and only cater for people with cars. (301, Hilltown)

Walkers were mainly resident in Hilltown and Perth Road.

Not many respondents had to travel more than 20 minutes for food shopping – 10 in all, 3 walkers, 5 bus passengers and 2 car drivers. There is little indication that respondents from any study area had significantly longer (or shorter) journey times than the rest.

How Healthy is the Dundee Diet?

Respondents to our survey were asked about their own consumption of fresh fruit and vegetables and several other foods that are usually regarded as particularly healthy (oily fish) or unhealthy (chocolate, cake, chips and crisps). They were then asked about their reasons for choosing the shop where they buy most of their food, 'selection of healthy food' being one of the alternatives provided. In a later question they were asked to rate the importance of ten factors in deciding where to buy food from, 'selection of healthy food' again being one of the options. The answers to these questions should provide evidence about the extent to which respondents would wish to have good access to healthy food, not just to food in general.

In the total sample, only 32 of 170 respondents (19%) estimating the average number of portions of fruit and vegetables eaten each day achieved the officially recommended number of five (see Table 3). Another 40 averaged four portions a day. A further 57 ate three portions, while 21 had two portions and 20 had one or none. This suggests that many Dundonians do not have a healthy diet. The scores for the six study areas were Lochee 27%, Broughty Ferry West 23%, Perth Road 21%, Baxter Park 15%, Whitfield 12% and Hilltown 6%. The lowest fruit and vegetable consumption was reported by Hilltown respondents over half of whom (52%) averaged two portions or less (significant at the 0.001 level).

Responses to the question about the frequency of eating oily fish showed that 56% ate it weekly or more often, while 23% had it rarely or never. Weekly consumption of oily fish was highest in Baxter Park (74%) and lowest in Hilltown

Table 3. Portions of fresh fruit and vegetables by Intermediate Geography zone

	Number of portions per day							
IG area	0	1	2	3	4	5	>5	Total
Whitfield	0	2	1	6	6	1	1	17
Lochee	1	3	1	6	5	2	4	22
Hilltown	3	6	6	9	4	0	1	29
Broughty Ferry West	0	2	6	8	8	5	2	31
Perth Road	1	0	2	13	6	2	4	28
Baxter Park	0	2	5	15	11	5	5	43
Total	5	15	21	57	40	15	17	170

(40%). Further questions were asked about consumption of chocolates and cake, and about chips and crisps. Approximately 17% of respondents ate chocolate and / or cake daily, and 76% did so at least weekly. Whitfield had the lowest daily consumption (5%) and Perth Road (25%) the highest. Only 7% ate chips or crisps daily, but 64% did so at least weekly. Lochee had the highest rates of weekly or more frequent consumption (79%) while Hilltown (57%) and Broughty Ferry West (58%) had the lowest.

The values reported above suggest that there were many residents of Dundee whose diets were far from healthy, especially as assessed by fruit and vegetable consumption. As respondents put it:

> Some people don't have the money or right information about healthy foods. (105, Whitfield)

> Most people here eat 'what they like' rather than 'what is good for you' ... So, most of them are overweight. (303, Hilltown)

Some respondents were aware of the problems faced (by themselves or others) in buying a good selection of healthy foods:

> Many elderly people live locally and without means of transport it must be hard to do everyday shopping. (418, Broughty Ferry West)

> We think it's quite nice to sort of go along and say we're eating five portions of fruit and veg ... when the five portions of fruit and veg might be sprayed stuff, might be not very healthy stuff, eh? (Katrina, Lochee)

> If you don't have a car you need to go to local supermarket which is dear and don't have the same range. Fruit is much dearer in local supermarket. (524, Perth Road)

However, in all six study areas there was a significant minority who did have a reasonably healthy diet, suggesting that problems of access to healthy food supplies can be overcome in our sample areas by at least some local residents. For example,

> We are spoilt for choice in this country where food is plentiful. (603, Baxter Park)

> More people are health conscious these days and are aware of what foods are unhealthy. (204, Lochee)

It has also emerged that different sorts of food, healthy or unhealthy, were consumed differentially between study areas. In particular, it would be an oversimplification to say that diets were similar in all three of the higher house value areas, similar in all three of the lower house value areas, and significantly different between the first three and the last three. For example, Lochee respondents have high scores for both fruit and vegetable consumption and for chips and crisps; Whitfield and Hilltown, both having very low house prices, have very different dietary profiles.

Who Shops Where?

Questionnaire respondents were also asked to name the shop where they bought most of their food. In all six study areas, most people mentioned one of the big supermarkets. In Whitfield, the dominant destination was Asda on Milton Road (11 out of 19 respondents), with others going to Morrisons, Tesco Kingsway, Asda Derwent Avenue and Sainsburys. None of the supermarkets is within walking distance of Whitfield but there appears to be a good bus service to Asda Milton (5 of the 6 bus users go there). Shopping choices are more diverse in Lochee, perhaps as a result of the closure of the Lochee Tesco. Tesco is still popular, however, with 7 people going to Tesco South Road, 6 to Tesco Kingsway and 2 to Tesco Riverside. Others go to the remaining food stores in Lochee – Lidl and Farmfoods – although it is clear that most of the respondents prefer the big superstores.

Hilltown is an inner suburban area with streets lined with small shops, but without a large local supermarket; accordingly the bulk of food purchases by Hilltown residents are divided between three more distant supermarkets – Tesco Kingsway, Asda Milton, and Tesco Metro in the city centre. The largest proportion of respondents from Broughty Ferry West had done most of their food shopping at Sainsburys, with a few going to Asda Milton, Tesco Kingsway and Tesco Metro, and others using the smaller food shops in Broughty Ferry. Perth Road contains many retail units, but has no major food store; the majority of respondents used Tesco Riverside, with small numbers at Lidl Dura Street, Tesco Kingsway, Asda Derwent Avenue, Marks & Spencer and Morrisons. Baxter Park has no superstore adjacent, but is within easy driving reach of several of the edge-of-town supermarkets; Asda Milton and Tesco Kingsway are the dominant locations, while a few went to Morrisons, Tesco Riverside, and Marks & Spencer.

The main findings from this analysis are that people in all our sample areas can reach a major supermarket in less than twenty minutes driving time, even though the supermarkets' locations are far from evenly distributed between different areas of the city. This is not to say that there are no problems in accessibility to good shopping opportunities in Dundee, but that these problems arise for people with disadvantages not attributable to location, especially those who do not have ready access to a car.

> Many elderly people live locally and without means of transport it must be hard to do everyday shopping. (418, Broughty Ferry West)

Although walkers and bus users may only need to travel for 20 minutes to reach the nearest supermarket, there may be other constraints facing them: the need to fit in with bus routes and timetables, limitations on how much they can carry, and hence how often shopping trips are needed, caring responsibilities, even the weather. Older people and sufferers from physical or mental ill-health may also have difficulties in buying healthy food. A chi-squared test of the relationship between respondent's physical health and the difficulty of buying healthy food was significant at the 0.0502 level, perceived difficulty being greater for those not in good health. This significance level suggests that significance at the 0.05 level would be likely if the sample were larger. A similar analysis involving respondent's mental health instead of physical health did not show a significant relationship. It is possible that people having any of these problems can cope with them, at least in part, by choosing less healthy foods which may be more easily obtainable.

Further evidence on how shoppers may trade off healthiness against other attributes of shopping alternatives is derived from the question where respondents select three attributes out of ten possibilities that might influence store choice. Those who picked 'selection of healthy food' were less likely to choose cheapness, being on a bus route or good reputation (all with statistically significant negative correlations). People who were constrained by prices or by reliance on the bus system tended to ascribe less importance to healthiness.

Conclusions

When we began this research project our main reason for undertaking the work was to examine the concept of 'food deserts' through a study of Dundee. Quickly it became clear that instead of questioning if Dundee could be considered as a food desert, it was more appropriate to examine healthy food access more broadly.

Indeed, it is evident that the six areas of intermediate geography studied cannot be neatly labelled as 'food deserts'. The initial drama that the 'food desert' concept invokes is not consistent with the reality of healthy food access in Dundee. We argue that the reality is that Dundee is a relatively small city that is easy for car users to move about in. Data from this project supports this argument given that few people travel for more than 20 minutes to access food shopping and that few people report it to be difficult to access healthy food.

Although few people within the 6 IG zones had difficulties accessing healthy food, it is significant to note that particular groups of people did have difficulties. In particular, the needs of bus users and people in poor health seem to be not very compatible with access to healthy food. This interesting finding strengthens Whelan *et al*'s (2002) argument that factors influencing the accessibility of healthy food vary between different groups of people. Whilst Whelan *et al*'s (2002) study highlights the access difficulties for groups such as mothers with children, we add to this work by highlighting the access difficulties that bus users and people in poor health face in Dundee. Future research should focus on specific ways that groups can achieve improved access to nutritious food.

Just as we highlight the importance of differing levels of healthy food access for different groups of people, it is important to underscore the importance of cost to healthy food access. Some respondents viewed healthy food as expensive. Consequently, price must be factored in to an analysis of access instead of defining access crudely in terms of distance.

Although unconvinced by the application of food desert theory to Dundee, we do not think it is helpful simply to blame individuals for consuming a poor diet. Already the importance of price has been stressed, but food choice is also influenced by social, religious and psychological factors. This conclusion is certainly consistent with the argument made in government reports (such as in Nelson *et al*., 2007) that it is important to consider the complex causes of health outcomes. It is certainly not sufficient to assume that everyone experiences the same barriers to healthy eating. Hence, food access must also be viewed from a variety of angles.

Movement away from simply labelling whole areas of cities as 'food deserts' towards examining the complexities of access will lead to much greater insights into this issue. Obviously questions of improving healthy food access are addressed by academics from many disciplines and many organisations, but geographers can make a distinctive contribution to this work. One way in which this could be achieved in the future is by using geographers' understanding of scale, such as the differing influences on decisions about diet at the individual, household, neighbourhood and national levels.

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