Socio-spatial variations in urban food price and availability and their implications for healthy eating

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ABSTRACT

Background: Previous research has suggested that foods which are beneficial to health are more expensive, and more difficult to obtain, in deprived as compared to affluent areas, and that this may help to explain the greater adherence to healthy eating guidelines in more affluent areas of the UK. Recent government policy initiatives to combat poor access to healthy diets have been partly based upon studies that have investigated intra-urban spatial variations in food price and availability. However those studies which provide the evidence base for government policy are: few in number, on a very small scale, and based upon data which in light of recent changes in the food retail economy may be out of date.

Aims: This study aims to rectify these problems, and to update and extend previous surveys. In doing so it addresses four main questions:

- Are there spatial variations in food retail provision in urban areas of the UK?
- Does the price and availability of food vary by type of shop in an urban area?
- Are there differences in food price and availability by level of deprivation in urban areas?
- Which is the strongest predictor of food price and availability: shop location, shop type or magnitude of area level of deprivation?

Method: A survey, on foot, of the price and availability of fifty-seven food items taken from the Family Budget Unit's 'Modest but Adequate Diet' (1993) was undertaken in a random sample of food retail stores drawn from the Public Registers of Food Premises covering the Glasgow area, a large and socially heterogeneous urban centre in the West of Scotland. A response rate of 97.7% (n=250) of eligible food stores was achieved.

Results: In the majority of cases, the price and availability of these food items did not significantly differ between areas at a variety of spatial scales. Those food items that did significantly differ in price were found, for the most part, to be cheaper in poorer areas. For food availability no real pattern was detected. The location of food shopping opportunities in the city was, on the whole, evenly distributed and the types of stores that present the greatest opportunities in terms of price efficiency and food availability

were evenly distributed in poorer areas. Some of those few foods that did differ significantly in price and availability were items whose consumption is discouraged in contemporary dietary guidelines.

Conclusion: This project is the largest and most systematic study of spatial variations in food price and availability undertaken to date in the UK. Previous research literature has suggested that food is more expensive and less available in poorer urban areas, and that some deprived urban areas do not have adequate food shopping facilities. This study provides some evidence that this is not the case in Glasgow in the late 1990s. Changes in the food retail economy since the early to mid 1990s may have precipitated this change.

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DECLARATION

I declare that this thesis embodies the results of my own special work, that is, has been composed by myself and that it does not include work forming part of a thesis presented successfully for a degree in this or another University.

Date: Signature:

Chapter 1: Literature Review

This thesis examines spatial inequalities in food price and availability and their implications for healthy eating. It seeks to extend previous work in medical sociology, food policy, public health and retail studies which has sought 'supply-side' explanations for social inequalities in diet. These 'supply-side' explanations have been generally investigated by exploring the geographical aspects of food price and availability in light of the changing context of the UK food retail economy during the late 1980s and early 1990s. Research in this sub-field is based upon a few small, mainly unrepresentative, very local studies in different areas of the UK. This thesis reports the results of a large-scale quantitative study that examines spatial differences in food price and availability in a major urban centre more systematically than has been done before. The main research questions in this thesis are, firstly, are there spatial inequities in the provision of food retail outlets in urban areas of the UK? Secondly, does the price and availability of food vary by type of shop in an urban area? Thirdly, are there differences in food price and availability by magnitude of area deprivation? And finally, which is the strongest predictor of food price and availability, shop location, shop type or area level of deprivation?

In this thesis the relevant literature is reviewed as each new topic is introduced. Chapter 2 discusses research methods and Chapter 3 describes the modern food retail economy. Chapters 4, 5 & 6 refer to this chapter, the literature review, which sets the scene for the thesis as a whole. This chapter provides a critical overview of the literature on geographical differences in health and diet-related mortality and morbidity and explanations for these. It also provides a conceptual background for the research questions contained in this thesis. The first section deals briefly with the underlying concepts that are used to explain geographical inequalities in health and how investigating food price and availability may add to this. The second section critically examines the literature on diet and social inequality, focusing on food price and availability in the UK and elsewhere. This section also asks why we need to undertake another price and availability study and concludes with a discussion on the paucity of empirical evidence cited in research and government food policy documents which form

the basis of recommended approaches to combat 'food deserts' and facilitate wider access to the food retail economy.

1.1 Geographical inequalities in mortality & morbidity

Mortality and morbidity differences between regions, areas and neighbourhoods have been observed in the UK and elsewhere for over 150 years. Macintyre (1999) cites Edwin Chadwick's 1842 report to the Poor Law Commission as one of the first to document between-place differences in age at death in the UK. Chadwick discovered that there were social and spatial differences between the three 'social orders' he identified. The most affluent class of 'gentry and professionals' did best in Bath and Rutland and the least affluent group, 'labourers and artisans', did best in Rutland. However both of these groups did the worst in Liverpool suggesting that both place and position in the social order made a difference to individual longevity. Even though absolute life expectancy for all social groups has increased since then, geographical patterns in mortality and morbidity are still routinely observed today in the UK. Some authors have suggested that the spatial polarisation of life chances between the best and worst areas of the UK are actually increasing (Phillimore et al 1994, Dorling 1997, Shaw et al 1999).

It has been demonstrated that people are up to 100% more likely to suffer from premature mortality if they live in the North and West compared to the South and East of the UK, in urban areas compared to rural areas and in places when there is an excess of households classed as materially deprived (Drever & Whitehead 1995, Dorling 1997, Macintyre 1999). Dorling's (1997) study on mortality in Britain from the 1950s to the 1990s using data from the British Census and the Registrar General's Office highlights that, nationally, mortality rates for all age groups have fallen by 28% between 1950 and 1992. However Dorling notes that there still exists persistent, and widening, geographical differences in mortality at all ages. In 1990-92 death ratios[1] (SMRs) were the lowest in the South Eastern counties such as Essex, Kent, Surrey, Buckinghamshire

[1] Standardised Mortality Ratios (SMRs) are a measure used to compare death rates in different segments of the population taking into account differences in the composition of those segments. SMRs are standardised to a mean of 100 for the whole population. Thus an SMR of 120 for one segment of that population would indicate that the Standardised Mortality Ratio for that segment is 20% above average.

and South Western counties such as Dorset and Wiltshire, especially in the rural parts of these counties. The highest death rates were found in the North West of England (Manchester, Liverpool, Salford & Oldham) and the West of Scotland (Glasgow, Greenock & Inverclyde, Coatbridge & Clydebank). The geographical 'gap' of mortality differences between the best and worst areas in the UK has grown substantially. In the 1950s those in the worst decile areas were 31% **more** likely to die than the average, while people in the best decile areas were 18.2% **less** likely to die than average before the age of 65. In 1990-92 those living in the worst decile areas of Britain were 42.3% **more** likely to die before the age of 65 than the average person while people in the best decile area were 23.8% **less** likely to die than the average person (Dorling 1997, Shaw et al 1999).

Charlton (1996) also analysed mortality differences by area in England and Wales and found that people living in areas classified as 'Prosperous' and 'Rural' tend to have the lowest risk of mortality, and those classified as 'Inner City' areas the highest. Charlton's analysis of mortality trends between 1981 and 1992 showed that better off areas experienced the greatest health gains, with relatively smaller improvements occurring in 'Inner London' and regions classified as 'Ports and Industries'. These 'Ports and Industry' areas were found to have the highest male excess mortality levels for malignant neoplasm, lung cancer, circulatory diseases, ischemic heart disease and cerebrovascular disease.

The patterning of morbidity and health related behaviour by area is very similar to that of mortality, with a general North & West and South & East divide in the UK (Shouls et al 1996b, Sloggett & Joshi 1998). One of the most well known studies of health-related behaviour is the Health & Lifestyle Survey (HALS) (Cox et al 1987, Blaxter 1990). This survey noted that a distinct North-South geographical patterning of self-reported health, health-related behaviour and lifestyle was clearly evident. The North & Midlands showed higher rates of chronic disease than the South and East (Blaxter, 1987). However it has been argued that this survey was marred by very simplistic and problematic statistical analysis which subsequent multi-level re-analyses have attempted to overcome (Duncan et al 1993).

Recent data from the Health Survey for England (HSE) and the Scottish Health Survey (SHS) confirms this geographical patterning of health-related behaviour, though cautions that regional differences are no longer as pronounced as they were in 1995, especially between Scotland & England. However in 1998 smoking rates and obesity, were higher in the North of England (comprising the Northern & Yorkshire and North West Health Authorities) and in Scotland (SEHD, 2000). Alcohol consumption was substantially higher in the North of England compared to the average in both Scotland and England (SEHD, 2000). More recent data from the Decennial Supplement on Geographic Inequalities in Health (Griffith & Fitzpatrick, 2001) shows that there still persists a North-South divide with Scotland, Wales & Northern Ireland having generally higher mortality rates by local authority than England for most age groups. However there are high mortality rates in the North of England though these tend to be concentrated within particular local authorities, often alongside authorities with low mortality rates. Inequalities between the regions of England tend to be greater than those between countries of the UK at all age groups, and inequalities within regions of England are greater than differences between the regions themselves (Fitzpatrick et al, 2001).

Explanations for geographical differences in mortality and morbidity

As has been demonstrated above, routinely available data from official sources shows distinct geographical differences in mortality, morbidity and health-related behaviour in the UK. However there is more to the spatial patterning of health than simply a description of 'isolated phenomena in space' (Jones & Moon 1993). Many researchers, both in the UK and elsewhere, have moved on from straightforward documentation of geographic differences in disease and mortality to the search for explanations as to why these differences exist. Debate has crystallised around two possible explanations: compositional and contextual.

Compositional and contextual effects on health

It has been suggested that differences in mortality, morbidity and health-related behaviour between places may be explained, in part, by the kinds of people who are resident in those places (a compositional explanation) or by differences between the places themselves (a contextual explanation).

Compositional explanations have been articulated as a major reason why there exists a distinct spatial patterning of health. Compositional explanations suggest that the socio-economic characteristics of residents of an area entirely explain any geographical differences in health. In response to a paper by Macintyre et al (1993) Slogget & Joshi (1994) concluded that it was more important to focus on people in developing health strategies than place of residence. Using the OPCS Longitudinal Study to follow-up nearly 300,000 individuals aged between 16 and 65 at the 1981 British census for all cause mortality over the following nine years, Slogget & Joshi (1994) used a measure of deprivation at the at the individual and census ward level to investigate any ecological effect on mortality after a number of individual socio-economic characteristics had been accounted for. A linear association between census ward of residence level of deprivation and health was discovered, but when a variety of individual level characteristics were introduced into the model (whether unemployed, deprivation, housing tenure, car access and social class) the association became statistically non-significant. Thus the authors concluded that "the evidence does not confirm any social miasma whereby the shorter life expectancy of disadvantaged people is further reduced if they live in close proximity to other disadvantaged people" (Slogget & Joshi, 1994 p.1473). Personal circumstances were more important than community level disadvantage, and it was suggested by the authors that health policies should therefore be targeted at individuals rather than areas. However it must be noted that this lack of association with area may have been due to confounding by including similar variables (in this case deprivation) in the model at both the individual and area level.

Macintyre et al (1993) in an influential paper described how a contextual explanation for geographical inequities in health might be conceptualised.

> *'Rather than treating the characteristics of areas as the sum of the individual characteristics of their residents, and instead of taking for granted what we all know about different sorts of places, this approach would seek to examine, systematically, those characteristics of areas which might influence the physical or mental health of their residents'* (Macintyre et al, 1993, p210).

Macintyre and colleagues went on to suggest which aspects of the physical, social and cultural environment might promote or damage health. They outline five broad arenas through which they believe contextual influences on health may operate.

1. Physical features of the environment shared by all residents of that locality (eg air and water quality, geology, latitude etc)
2. The availability of healthy/unhealthy environments at home, at work, and at play (eg housing provision, secure employment, safe recreation)
3. Services provided, privately or publicly, to support people in their daily lives (eg. education, public transport, policing, churches, community groups etc)
4. Socio-cultural features of neighbourhoods (eg the past and current socio-political climate, norms and values, community integration and support)
5. The reputation of a neighbourhood (eg perceptions of area by residents, outsiders, statutory bodies influences migration patterns and self-esteem and morale of residents).

This conceptualisation was borne out of an apparent lack of truly ecological data in previous analyses investigating geographical differences in health. In many previous studies, area-level data were used as surrogates for missing individual level data i.e. data was aggregated up to the geographical scale of choice from individual level secondary sources such as census surveys. Thus the resulting analyses and hence their explanatory power are prone to the ecological fallacy, a logical fallacy inherent in making a causal inferences from group data to the individual (Schwartz 1994). It has also been suggested that these type of studies were not measuring 'true' features of the environment in which one was interested, features of the environment which could be conceptualised to exert an effect over and above properties of individuals. Thus the authors advocated directly studying features of the local social and physical environment which might promote or inhibit health as well as suggesting that focusing on places as well as people could help improve population health.

Subsequent to these two important papers there has been much to debate over the nature, extent and importance of composition or context in determining population health. A number of papers have sought to untangle the relative importance of contextual as opposed to compositional effects on health. Some studies analysed the

effect of area level of deprivation (the contextual measure) once individual measures of deprivation (the compositional measure) were taken into account and found there to be little or no contextual effects on health. These studies have included analyses of mortality and morbidity (Slogget & Joshi 1994), psychiatric morbidity (Duncan et al 1995) and health-related behaviour (Duncan et al 1993).

Contextual influences have been demonstrated for a number of health outcomes and health-related behaviour, including diet and obesity (Forsyth et al 1994, Ellaway et al 1996, Diez-Rouz et al 1999), increased accident rates in pre-school children (Reading et al, 1999), health related behaviour (Duncan et al 1996, Ellaway & Macintyre 1996, Ecob & Macintyre 2000), smoking (Diehr et al 1993, Duncan 1999) mortality (Congdon 1995, Congdon 1997) and long standing illness (Gould & Jones 1996, Shouls et al 1996a, 1996b). However as a caveat most authors have tended to agree that individual social and clinical risk factors for health probably account for more variation between geographical areas than explicitly area level factors. So how do the debates surrounding context and composition apply specifically to inequalities in diet-related health behaviour?

Returning to Macintyre et al's (1993) paper we can understand that potential contextual influences on health are best understood as an important mediating influence between place of residence and health status. In order to conceptualise this process Macintyre and colleagues have described 'local opportunity structures' as agents of this mediating role. Macintyre et al (1993) define local opportunity structures thus:

> *'Lack of...opportunity [structures] to lead healthy or health promoting lives may be as important for assessing the health needs of the populations as knowledge of their personal characteristics, and polices designed to improve local environments may be as effective as individually targeted health promotion activities'* (Macintyre et al 1993, p232)

Examples of 'opportunity structures' given in Macintyre et al's paper are; facilities for sport and recreation (which might have an effect on exercise patterns), availability of primary health-care services (which might impact upon service uptake), public transport (to access essential services) and the availability food shopping outlets (which might

affect the price and availability of healthy or unhealthy food). This last example describes a possible causal contextual interaction between the material infrastructure of the local environment and spatial inequalities in diet and thus can be viewed as an important conceptual starting point to this thesis. As Whitehead (1998) has noted it is clear that nutrition is not just a matter of individual choice and behaviour and that policies pursued by corporations and institutions can have a profound effect on people's lives, especially those who live in the poorest conditions. So how does investigating the price and availability of food contribute to understanding geographical differences in health? Many researchers have suggested that the lack of food shopping opportunities may be one explanation as to why individuals who live in more deprived areas have a poorer diet than those who live in more affluent areas – a topic which is explored in Chapter 1.2.1 (Leather 1992, Henson 1992, Killeen, 1994). This may provide one contextual mechanism through which poor diet is produced and maintained, in other words a situation whereby personal desires to eat healthily are thwarted by a lack of access to, and choice of, foods as well as high prices. This next section expands and examines the evidence for this premise and provides an overview of the literature in this area.

1.2 Diet, Deprivation & Context

Since the publication of John Boyd Orr's Food, Health & Income (1937) on the nutritional status of the poor in Glasgow, the link between deprivation, nutrition and health status has been widely studied. Research has continued to highlight the many ways in which diet and deprivation combine to produce and maintain socio-economic inequalities in health (Dobson et al 1994, Dowler & Calvert 1995, Dowler & Dobson 1997, James et al 1997) although some authors argue that nutrition's precise role in generating inequalities in health is difficult to delineate (Davey Smith & Brunner, 1997). Campaigns by health educators have recently focussed on the benefits of eating a healthy balanced diet, and promulgated messages to increase intake of fresh fruit, vegetables and fibre; and lowering intake of crisps, red meat, sweets, sugars and fatty foods (Scottish Office 1993, DoH 1994, Scottish Office 1996). A meta-analysis of randomised control trials evaluating the effectiveness of dietary advice for chronic disease prevention has shown modest improvements in diet and cardiovascular disease risk 9-18 months after intervention (Brunner et al, 1997). However, population dietary

changes which may indicate widespread take up of these messages have yet to be reflected in official statistics. Studies have demonstrated that individual knowledge of what constitutes a healthy and unhealthy diet is fairly sophisticated in low income groups (Dobson et al 1994), a finding which has prompted researchers to look elsewhere for reasons for non-adherence to dietary messages.

1.2.1 The social patterning of diet

Studies of diet and deprivation have tended to primarily focus on levels or personal or household disadvantage. Engels (1845) believed it was obvious that deficiencies in nutrition contributed to the poor health of the labouring classes. As Davey Smith & Brunner (1997) noted the dependence of dietary adequacy on financial wherewithal was clear and they extensively quoted Engels thus:

> *'The better paid workers, especially those in whose families every member was able to earn something, have good food as long as this state of things lasts; meat daily and bacon and cheese for supper. Where wages are less, meat is used only two or three times a week, and the proportion of bread and potatoes increases. Descending gradually, we find the animal food reduced to a small piece of bacon cut up with potatoes; lower still and even this disappears, and there remain only bread, cheese, porridge and potatoes, until on the lowest rung on the ladder, among the Irish, potatoes form the sole food'*
> (Engels 1845 in Davey Smith & Brunner 1997)

To some extent Engels' assertions remain applicable today in that those who suffer from the worst financial constraints are less likely to purchase a healthy diet, with low-income households residing in less affluent areas suffering the worst nutritional disadvantage (Travers 1996, Dobson et al 1994). The inability of individuals and households with a low income to afford a healthy diet has been termed 'food poverty'; a term coined by academics and food activists to convey the notion that income and nutritional status are inextricably linked. However the number of studies which specifically investigate the relationship between income and nutrition are suprisingly small. Europe-wide, it has been argued, there is a lack of official published data about the nutritional conditions of the poor. Those who are poor are often missed out of

official surveys, and their circumstances are not often specifically studied elsewhere (Dowler & Dobson 1997).

Data from British surveys often use proxy variables for income such as employment status, benefit receipts and housing tenure as routine questions on income are not included in official surveys as they are elsewhere. In *The Dietary & Nutritional Survey of British Adults* (Gregory et al 1990) it was found that men and women who were unemployed had significantly lower intakes of many vitamins and minerals, as did those living in households in receipt of welfare benefits, compared with those not in these conditions. Young children, aged between 1.5 and 4.5, of parents from the manual social classes or from less advantaged homes (where the head of household was unemployed or claimed means-tested benefits) had lower intakes or blood levels of carotene, niacin, vitamin C, iron, calcium, phosphate and potassium than those of non-manual or more advantaged households. Children from lone-parent families had lower levels of carotene and vitamin C (Gregory et al 1995). Data from the 1998 Health Survey for England (HSE) shows that low head of household social class is associated with high fat intake (38% of energy intake for Social Class V compared to 19% for Social Class I), and that there exists a strong linear class gradient for both sexes, though men do have a much higher fat intake than women. The HSE also showed that there is an inverse relationship for fibre intake, with a progressive lowering of fibre intake from Social Class I to V. Women were also reported to consume less fibre in all social classes than men (Erens et al, 1999). The National Food Survey (ONS, 1999) reports that the consumption of fruit and vegetables by Government Office Region is highest in London, South East & South West of England compared to Scotland, Wales, North West, North East and Yorks & Humberside. In the National Food Survey this geographical north-south divide is repeated for average expenditure per person on food per week, nutrient intake, fat consumption and a range of other diet-related indicators. However these data must be treated with caution, as it does not allow for regional variations in pricing, household composition and food eaten outside of the home. This last point is an important omission as food eaten outside the home, such as fish and chips, has traditionally been a way of feeding people in deprived areas in the North East and North West of England (see Walton 1992). The amount of food eaten outside of the home has increased massively in recent years.

The 1998 Health Education Monitoring Survey (HEMS) (Rainford et al 2000) is a survey conducted to measure a range of health promotion indicators of individuals living in private households. It was found that diet quality and knowledge about diet varied by age with those in younger (16-24) and older age groups (75 and over) more likely to have a 'less healthy diet'. Diet quality improved with age until the 55-64 age group. Diet quality was also consistently lower for men compared to women. Good dietary knowledge (individuals who identified three or more components of a 'healthy diet') was found in the middle age groups with those in the youngest (16-24) and oldest (75 and over) have substantially worse levels of knowledge. HEMS is unusual in that it is one of the few surveys that collects income data from respondents. It found that household income was related to diet quality (of those with a household income <£5000 37% of respondents had a less healthy diet compared to 17% of respondents with a household income of >£20,000). Household income was also related to knowledge, with an increase in dietary knowledge associated with rising income. However this relationship only existed for men. Among women, only those in the highest income group had significantly higher levels of knowledge of what constitutes a healthy diet.

In a study in the West of Scotland of 'healthy' and 'less-healthy' eaters it was found that 'less healthy' eaters were "more likely to be male than female, from lower income or non-manual households, and were more likely to smoke" (Anderson & Hunt 1992, p.8). Similar results for adolescents aged 15 years were reported from the same study, which also showed that lower fruit and vegetable intake was associated with smoking, non-owner occupiers, males, lower income groups, older adults and those in the manual social classes (Anderson et al, 1994a, 1994b)

There are also a handful of studies that consider the effects of community or neighbourhood measures of deprivation, as opposed to individual or household measures, on diet. Cade et al (1988) in a study of 2340 men and women aged 35-54 in three English towns (Ipswich, Stoke-on-Trent and Wakefield) found that geographical inequalities in mortality between these three towns (in particular death from ischaemic heart disease) could not be attributed to the small geographical differences in the consumption of energy or fat in middle life. However the data did show distinct differences between towns with Wakefield, a poorer northern industrial town, having lower mean daily intakes of fibre, energy, fat and all main nutrients than Ipswich, a

more affluent southern market town, though the social class distribution within the two towns was similar.

Forsyth et al (1994), reporting on a study of four localities in Glasgow, showed that the most socially advantaged neighbourhood consistently recorded healthier eating patterns and the most socially disadvantaged neighbourhood tended to record the least healthy. This association persisted after a number of potentially confounding variables (age, sex, class, housing tenure, car ownership and income) were taken into account. These findings lead the authors to suggest a dynamic model of community influence, taking into account household resources, local food price and availability and cultural factors such as traditional beliefs about appropriate or healthy diets which may impact upon community nutritional health.

Similar findings were also found in an analysis of four communities in the USA. Diez-Roux et al (1999) found that living in a lower income neighbourhood was generally associated with decreased energy adjusted intake of fruits, vegetables, fish and an increased intake of meat. These patterns were also found to persist after adjustment for individual level income, but associations were weak and were not often statistically significant. As with Forsyth et al's (1994) study the authors speculated that cultural or supply factors could be important in explaining these neighbourhood differences in diet and that public health efforts to change dietary habits may benefit from further research into possible community level determinants of diet.

In summary, from the evidence outlined above, the poorest diets tend to be associated with the poorest people and the poorest places. Though low income has an undoubtedly large part to play in the socio-spatial patterning of diet, it has also been suggested that those who are on a low income and who live in more deprived communities may be at an additional disadvantage when attempting to access a healthy diet because of the high cost and poor availability of food in their local area.

1.2.2 The price and availability of food

The current study tests the hypothesis that socio-spatial differences in food consumption and patterns of diet-related disease may partly be explained by the uneven distribution of food price and availability. Food availability can be conceived of in the widest sense,

from the number and type of stores in neighbourhoods to the amount of food available on shelves in individual stores. This section provides a critical overview of those few studies that specifically investigate food price and availability, and describes some of the problems associated with them.

Caplovitz (1963) in a study of 464 New York families presented one of the earliest studies that focused on the problems faced by low-income consumers, particularly ethnic migrants. Caplovitz found that the poor faced a double disadvantage when taking part in consumer society and he found that there existed a consistent pattern where low-income families, ensnared by a marketing system based upon credit and loans, to purchase expensive consumer durables. Though this study was not expressly about food the findings prompted a slew of studies that investigated the price the poor paid for a variarey of goods and services, for example television sets in Los Angeles were found to cost more in 'ghetto' areas than elsewhere (Sturdivant & Wilhelm 1968). Most of these subsequent studies have, however, been primarily concerned with food prices.

Piachaud (1974) references several early studies that focus on the cost of food in poor areas. The US Bureau of Labour Statistics (1966), in a study of thirty stores in six cities, found that, while prices in multiple stores (referred to as chainstores) did not differ significantly between low and high income areas, small independent stores, which on average charged higher prices, constituted a larger proportion of food sales in low income areas. Dixon & McLaughlin (1967) in their study of 87 supermarkets and 153 neighbourhood stores in Philadelphia found that a larger share of food shopping by low-income groups was carried out in smaller stores which had generally higher prices. Conversely Goodman (1965) studying a public housing area, also in Philadelphia, concluded that the poor *did not* pay more for their food in that area as they shopped at more price competitive stores outside of their immediate residential area. In Detroit, Project Summer Hope (1968) discovered wide variations in price, with both multiple stores and independent stores showing significant price discrimination against low-income ghetto areas.

Cole-Hamilton and Lang (1986), in their seminal report for the London Food Commission on the impact of poverty on food consumption, were among the first to note that low-income consumers may be hit by the reduction of food retail choice due to

changes in the food retail industry (see Chapter 3 for a full discussion of contemporary retail change in the UK) as the following quote illustrates.

> *'In a recent [related] pilot study of Londoners' access to food, the London Food Commission concluded that the trend towards locating the new generation of superstores out of inner city areas and into more affluent income belts not only threatens to condemn already hard-hit social groups to further constriction of retail choice but also threatens to raise the cost of food to the already disadvantaged'* (Cole-Hamilton & Lang, 1986 p.72)

Using a number of key, representative food items from the National Food Survey, Cole-Hamilton & Lang's pilot study found that low-income consumers paid on average £4.60 per week more (a value at the time which added around 21% to the weekly shopping bill) if forced to shop locally, in a store with a limited range of products, than if they had shopped at a larger out-of-town food superstore. It was also discovered that there were price variations between stores within the same retail chain in London, differences that ranged between 1% and 9% (London Food Commission, 1985).

A study undertaken in London has become one of the most oft-quoted sources for evidence to support the hypothesis that healthy food costs more in deprived areas. Mooney's (1990) study investigated the cost and availability of items in two food shopping baskets, 'Basket A' (recommended foods in a healthy diet) and 'Basket B' (foods to be reduced in a healthy diet). Her study, based in Hampstead, London surveyed nine of the largest supermarkets in the area – both in and adjacent to the Hampstead Health district - and were divided into outlets which were located in either an 'affluent' or 'deprived' area. Healthy Basket A was found to be 21% more expensive than Unhealthy Basket B in the more deprived area, and 17% more expensive in the more affluent area. In terms of availability, on average, there were only two choices of each item in Basket A whereas there were three choices for Basket B.

Similar studies have also been undertaken elsewhere in the UK. Burrows et al (1991) in a study undertaken in Sheffield found that for a selection of basic foods and their healthy alternatives, the healthy alternatives were 4% more expensive in the more deprived area, with no difference in the more affluent area. These basic foods were also

slightly more expensive in the poorer area. In a study in the West of Scotland, Sooman et al (1993) also discovered differences in food price. The authors reported that both a selection of 'healthy' and 'less healthy' foods were comparatively more expensive in a socially disadvantaged area compared to a more affluent one. Additionally these 'healthy' items were relatively more expensive than the alternative 'less healthy' selection within each of these areas. Although the absolute price differences between the rich and poor area for both the 'healthy' and 'less healthy' selection was small, the authors suggested that the magnitude of price difference would be much greater if the baskets used in the study were constructed for a week's shopping for a family of four. The availability of food items in the same study was also found to be greater in the richer area for both the 'healthy' and the 'less healthy' baskets. Barratt (1997) found that in the late nineties, with the overall cost of food sold in supermarkets coming down, a healthy diet was still more expensive than the average diet within multiple-owned supermarkets in Southern Derbyshire.

Piachaud & Webb (1996) contend that the shop type a consumer uses is important in determining the price and availability of food. The authors compared food prices in a range of shop-types in Northampton, and in pairs of similar shops in five areas around Britain (Twickenham, Wapping (East London), Kennington (Central London), Central Glasgow and Haverfordwest (Wales). A 'basket-of-goods' survey method was employed. This basket contained a range of the most popular and basic foods, and prices were compared within Northampton and between the other surveyed areas of the UK. A price index was devised using J. Sainsburys' food prices as baseline. In Northampton the multiple-owned stores tended to be cheaper than the smaller convenience stores and corner shops, both in terms of a 'whole basket of goods' price index and a cheapest available food item prices index. However these price/shop comparisons did not take into account food quality, bonuses for loyalty or dividend cards nor special offers or in-house promotions. These patterns were repeated for the other surveyed areas in the UK and price differences for individual food items between the smaller stores and the larger multiple-owned outlets ranged from 24% to 60%. In conclusion Piachaud & Webb (1996) suggested that as low-income families spend roughly a quarter of their income on their food budget they are losing roughly one-tenth of their total income if they are forced to buy food in more expensive stores.

Studies undertaken in North America have also investigated whether geographical differences in food price exist. MacDonald & Nelson (1991) compared the prices of a range of food items across several US cities, and also compared food prices in poverty and non-poverty areas, and between city centre and suburban stores. They discovered systematic variations in food price within metropolitan areas. In poorer neighbourhoods the price of food tended, on average, to be 2% higher than in more affluent neighbourhoods, though it was demonstrated that these differences could be ascribed, in the most part, to differences in store type (generally smaller and more expensive) in poorer, older, neighbourhoods with more stable populations (see Chapter 3). Cotterill & Franklin (1995) echoed these results in their study of food access in 21 metropolitan areas in the USA. Their primary concern was the level of food access for those on a low income or in receipt of public assistance and specifically whether these populations had less access to supermarkets. Using data from the 1990 US Population Census and *The Progressive Grocer* supermarket database it was found that for those individuals in receipt of public assistance, there was a linear relationship between quintile of public assistance by zip code and the number of supermarkets. Those in zip codes that fell into the quintile category with the highest number of individuals in receipt of public assistance had the fewest number of superstores, prompting the authors to describe the areas with less access to supermarkets as suffering from an 'urban grocery store gap'.

Consumer associations in the USA have also become interested in inequitable access to food. The West Coast Consumers Union (Troutt 1993) were concerned about safeguarding 'quality foods for all' in a changing retail landscape, and were particularly worried about the discrepancy between low and middle income consumers. Two Californian neighbourhoods were compared: Oakland (a very deprived, ethnically diverse area) and Rockridge (a predominantly white, middle-class suburb). A typical monthly food basket was purchased in a range of supermarkets of a similar type across the two neighbourhoods and the prices were compared. Those supermarkets in the poorer Oakland neighbourhood were found to be between 15% and 28% more expensive than those in Rockridge. Interestingly, even when supermarkets compared favourably with each other on price it was also found that shoppers tended to shop outside of their area because they believed that there are price and quality benefits to shopping in more affluent areas. This suggests that the shopping experience itself is important in determining perceptions of food price and availability. Troutt (1993)

concluded that in the USA, small neighbourhood stores run virtual monopolies in poor neighbourhoods and operate a 'price gouging' policy, extracting as much revenue as possible from those on low incomes forced to shop in those areas. As the remaining supermarkets in low income areas have discovered, the continuing absence of new stores and commercial investment has stigmatised local shoppers and generated mistrust of those stores that do remain – a finding that has also been reported in Scotland (Smith & Sparks 1997).

Prompted by this report, Alwitt & Donley (1997) undertook a comprehensive investigation of access to different types and sizes of commercial establishments in Chicago, including other service and retail establishments as well as food supermarkets. They found that in poor compared to non-poor Chicago zip-codes (defined as meeting a threshold for poverty rate, high school graduation rate, labour-force participation and unemployment) there were fewer retail outlets, fewer large scale grocery supermarkets and more small scale convenience stores. The study also found that there were fewer discount or low cost stores within these poor neighbourhoods, even though it could be argued that they experienced the greatest need for them. Alwitt & Donley (1996, 1997) speculate that geographic isolation offers business an opportunity to charge higher prices in poor areas. The authors agree with Troutt (1993), that negative public and commercial perceptions of business and retail facilities and opportunities in poor areas can militate against business location and deter people from using local shops and services.

1.2.3 Problems with food price and availability studies in the UK

Food price and availability studies are relatively few in number in the traditional academic literature considering the amount of media and public interest these issues generate (Kibby 1998, O'Sullivan 1998). However there are a number of common methodological and conceptual problems associated with these studies.

Firstly, the selection of foods in some surveys does not constitute a 'real' diet. Food 'basket' surveys are just that, a selection of everyday individual food items. Developing a healthy meal that meets current official dietary and nutritional standards, individually or for a family, with those basket constituents would be difficult. For example foods sampled in a study by Sooman et al (1993) took the form of just ten items and their

healthy alternatives. These items included full fat vs. low fat milk, sausages and their low fat alternatives and white vs. wholemeal bread in order to allow price comparisons to be made between 'healthy' and 'unhealthy' foods. Though this study is useful you would be hard pressed to actually create a palatable, nutritionally balanced everyday meal from the limited number of items included. There have been few attempts to survey a more realistic diet that contains 100% of the required nutritional dietary reference values. An exception to this is Mooney's (1990) work. She used National Advisory Committee for Nutrition Education (NACNE) recommended guidelines and compared the cost of this ideal NACNE diet with that of average diets consumed by low income consumers. The average diet of a low-income consumer was based upon data on foods consumed by households in income band D from the National Food Survey (NFS). Mooney found that even to make some health changes from the NFS to the NACNE diet i.e. switching to wholegrain and low-fat products would substantially increase the cost. In the 'deprived' area of Hampstead the NACNE diet was 73% more expensive that the average low income diet from the NFS. Price comparison/basket studies can also be seen as problematic when attempting to compare like-with-like food items. Surveys of this kind need to be very prescriptive in terms of brand (manufacturer brand or supermarket own brand), pack size, food quality (different supermarket brands may be of different quality) as well as trying to take into account very short-term offers such as buy-one-get-one-free or price reduction promotions. These problems make comparing different basket surveys very difficult as it is unlikely that each different basket survey would be identical in terms of it's constituents and prevailing market conditions at the time the survey was undertaken. In order to get round this problem manufacturer brands are often used in basket surveys. However with the rise if 'supermarket own brands' these traditional manufacturer brands, such as Heinz, are now less important in supermarkets (Wrigley, 1998b).

Secondly, most previous surveys have also been (often by necessity) conducted on a small scale. For example, the oft-quoted study by Mooney (1990) only surveys seven supermarkets in a small area of North London and Sooman et al (1993) only surveyed twenty shops two areas within Glasgow City. Work of this nature, though useful, is not of sufficient size to generate generalisble findings which may be applicable to other parts of the UK. Many of these studies also assume that all neighbourhoods and areas are equal and fail to consider particular problems associated with different types of

residential area in an urban setting. For example an urban post-war peripheral housing scheme may be similar in terms of its social class composition to a similarly deprived inner-city area in the same city, however its access to the transport infrastructure, and hence to shopping opportunities, may be very different. This methodological problem is common to the majority of food price and availability studies in the UK. Though a number of US studies have demonstrated food price differences across zip-codes (Alwitt & Donley 1997, Cotterill & Franklin 1995) these studies may be regarded as the taste of the future as many retail commentators agree that the US retail system is approximately a decade more advanced that of the UK (Sparks 1996, personal communication).

Thirdly, though data have now been collected from a number of differing areas in the UK and elsewhere it is still not clear whether there exists a 'linear' or 'threshold' relationship between food price and availability and area level of deprivation. Much research suggests that living in a poor area ensure that residents of these areas suffer from a double disadvantage of low income and poor range of shopping choices. However there is very little evidence to support the hypothesis that as the residential area or neighbourhood gets poorer, food becomes more expensive and less readily available. Surveys have simply focused on an affluent/deprived dichotomy of neighbourhood classification in a very small number of places and have not considered the full range of social and material deprivation. Indeed work such as this may suffer from the ecological fallacy, a logical fallacy that assumes all people who live in a certain area share personal characteristics (Schwartz, 1994). In this case it would suggest that all residents of poor places are poor and thus residents of these poor places would have similar problems when faced with poor local access to food. However recent work by Berthoud (2001) suggests that this may not be the case as he discovered that poor households were not that highly concentrated in poor areas as one might expect. In fact only 31% of households in the lowest income areas were 'poor' and only 40% of households in high-income areas were 'rich'. This finding is also supported by McLoone (2001) whose work in Scotland suggests that selective targeting of poor people on an area basis would miss more poor people than they would include. The experience of accessing to food may thus be very different for different individual residents who live in the same place.

A final implicit assumption is that urban food supply system is stable and unchanging. The retail sector is a very dynamic and in this context previous work is now rather outdated with the most recent studies being conducted almost ten years ago. Up-to-date research is required to see whether spatial inequities of food access still exist in light of recent changes in the food retail economy (see chapter 3 for an outline of recent changes).

Food economy, food politics & food policy

The studies outlined above have been, in part, used by academics, food activists and policy-makers to promote concepts such as 'food deserts' and 'disadvantaged' consumers. It is useful here to briefly outline what is meant by these concepts in relation to the policy climate at the end of the 20th Century and therefore highlight why it was important to conduct this study.

Food deserts in policy documents

The term 'food desert' is increasingly being used as shorthand by policy-makers and community groups to describe populated areas where there is a lack of opportunity to 'access' an affordable and healthy diet (Cummins & Macintyre 2000). The term 'food desert' has been attributed to a policy working group for the Low Income Project Team of the 1992-1997 Conservative governments' Nutrition Task Force (Beaumont et al 1995) and has gained increasing currency in the UK and internationally. One definition of 'food deserts', as good as any, was reported in The Independent newspaper:

> *'Food deserts, the minister of public health was told...are those areas of inner cities where cheap, nutritious food is virtually unobtainable. Car-less residents, unable to reach out-of-town supermarkets, depend on the corner shop where prices are high, products are processed and fresh fruit and vegetables poor or non-existent'* (Laurence 1997 quoted in Whitehead 1998)

Recent official reports such as the Social Exclusion Unit's report on Neighbourhood Renewal (SEU 1998) and The Independent Inquiry into Health Inequalities (Acheson 1998) have also mentioned 'food deserts' as phenomena which can potentially damage population health through restricting the availability and affordability of foods which may be beneficial to health. Though it must be noted that official and popular

definitions of 'food deserts' such as that outlined above tend to portray 'food deserts' as purely an urban phenomenon. There is some evidence to suggest that remote and rural areas also suffer from food access problems (Clark et al 1995). The Inquiry into Health Inequalities recommended the following.

We recommend policies that will increase the availability and accessibility of foodstuffs to supply an adequate and affordable diet (20)

We recommend the further development of policies that will ensure adequate retail provision of foods to those who are disadvantaged (20.1)
(Acheson 1998 p65-66)

These recommendations were not made in isolation. A similar line was also adopted by the current Labour government's Social Exclusion Unit whose Action Team 13: Shops (SEU 1998) outlined its terms of reference as being to identify best practice and innovative approaches in improving shopping access for people in poor neighbourhoods. The remit included:

'ways of promoting existing good practice e.g. subsidising estate-run food co-ops, providing own-brand goods for small shops, using discounting to encourage healthy eating, offering home shopping or special buses, or linking small retail outlets to public sector facilities such as health centres' (SEU 1998, p73)

For health promotion experts and food policy activists this has provided a long-awaited acknowledgement that problems exist for those on low incomes outside of the current health promotion focus on individual lifestyle choices and behaviours when accessing an affordable and adequate food supply (Whitehead 1998). However, does the academic evidence upon which the aims and objectives of current food desert policy initiatives are based merit these laudable aims?

Contestable evidence?
Much of the cited empirical evidence (in the case of the SEU report only one reference) for these policy statements is ambiguous and based upon small, sometimes very unrepresentative, sample populations in highly localised settings. Though previous

studies have made a strong case for healthy food being more expensive than unhealthy food in a like-for-like sense (eg. white vs wholemeal bread; butter vs margarine), there is limited evidence to suggest that a range of foods systematically costs more in deprived areas. One policy document, the Independent Inquiry Into Health Inequalities (Acheson, 1998) made extensive use of two pieces of work, Mooney (1990) & Piachaud & Webb (1996), to support a case of policy-led intervention. These papers, though important in several ways, do not entirely support the assertions made in these documents. Within the Independent Inquiry into Health Inequalities they are used to support the following statement:

> *'there is a paradox that a healthy basket of food has been found to cost more in disadvantaged areas than in affluent areas...[this] has led to the creation of 'food deserts'* (Acheson, 1998, p.65)

However on examination of the source papers for these statements, a different picture emerges. Table 1.1 below is a reproduction of original data from research undertaken in Hampstead, London, from Mooney's paper.

Table 1.1 Comparison of the mean cost of Shopping Baskets A and B (standard packet sizes) in the entire district, in the deprived areas and in affluent areas.

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

**p<0.01, ***p<0.001 (Source: Mooney 1990, p.114)

Figure 1.1 shows quite clearly that the assertions outlined above cannot be supported on the strength of this evidence alone. A healthy basket of goods does cost more than an unhealthy basket of goods in both areas but 'Healthy Basket A' is **cheaper** in the more deprived area than the more affluent area, and similarly 'Unhealthy Basket B' is also **cheaper** in the more deprived area.

Similarly the second cited work, Piachaud & Webb (1996), also cannot be used to support the above statement. Their primary work is a thorough demonstration that the type of shop which a consumer uses is important in determining the price and availability of food; **it does not** compare rich and poor areas, only different areas of the UK.

Recently published commissioned work from the Competition Commission (2000) report on the practices of multiple food supermarkets has found little evidence for the existence of food deserts in British cities. Their work revealed no evidence for food deserts in 100 postal sectors with the lowest average incomes. The study showed that the furthest distance a household had to travel was 1.3 miles of their home. The study also revealed that the proliferation of supermarkets was highest in the poorest areas compared to elsewhere. Food pricing in low-income areas was also not found to be inflated as a result of pricing strategies of the main parties in those areas. In fact evidence was presented that indicated that the provision of economy had in fact been increasing in those areas.

To summarise, it has been found that the price and availability of food can vary according to whether an area is affluent or deprived, or by the type of shop that consumers use to make their food purchases. The evidence is based upon studies undertaken in the UK and elsewhere (though mainly in the US). However there are three main problems with this work. Firstly, the robustness of the various studies can be called into question due to the small sample sizes involved and the choice of food items used in 'basket' studies. Secondly, much work is now rather outdated. With the business of food retailing being one of the most dynamic economic sectors in the UK, rapid changes in contemporary food retailing practice may have reduced or exacerbated variations in food price and availability. Finally, empirical evidence cited in policy documents has been demonstrated to be less clear and robust than one would wish, or contrary to what some policy documents have been promoting. There is a pressing need to undertake more robust, generalisable, systematic work that can feed directly into the policy evidence base.

1.3 What this study does

The literature described above and subsequent criticisms of it have demonstrated a need to formulate more complex models of food price and availability in urban settings. Most previous literature has either assessed the association of area-level of deprivation with intra-urban differences in food price and availability and food consumption or looked at the effect of shop-type in determining the price and availability of food. None of these studies have sought to combine these two variables (price and availability) in a single study in an adequate and robust manner. The studies outlined in this chapter have also been chiefly concerned with *urban* food price and availability – there is clearly a need to build on that in a more systematic manner. Rural food access and poverty is a separate issue and is not dealt with here.

There is also a level of myth making in the food policy arena. Consistent robust evidence from systematic, generalisable studies need to be gathered. Work in this field is important and the few studies that exist in the traditional academic literature as well as well as in the 'grey' literature have usefully pointed to a number of problems in accessing a reasonably priced and easily available healthy diet. As Lang (1997) has pointed out there is now a recognition in food policy circles that firstly, poverty relates to ill-health and that most importantly the food retailing revolution has to some extent bypassed and excluded the poor.

This study aims to address these problems by undertaking a large, systematic study of variations in food price and availability in an urban setting (Glasgow). This project hopes to strengthen the evidence base on 'food deserts' and as a consequence also illuminate a plausible contextual food-related pathway from area of residence to health status. The next chapter describes the methodology used to achieve this.

Chapter 2: Design and Methods

In order to investigate how the provision of food retail facilities, geographical location and area level of deprivation determine a household's ability to access and pay for food, a sample of shops representative of where people buy their everyday groceries was required. To achieve this, a price and availability survey of 371 food retail outlets in 19 localities within the Greater Glasgow Health Board area was undertaken during the summer of 1997. This chapter describes how this survey was designed and implemented as well as outlining reasons for choosing the fieldwork setting, sampling frame, sample size, the method of data collection, and a brief note on the usefulness of secondary data included in this study.

Empirical surveys allow the testing of a specified set of research questions through the generation of adequate amounts of quantifiable information to test whether a) whether there are any observed differences within a population and b) if they are due to chance. Within this survey the research questions seek to investigate whether there are differences in food price and availability by area, the type of shop or by magnitude of area deprivation, and if these observed differences are due to chance. In order for this question to be adequately explored a quantitative as opposed to qualitative approach is required. Once a large enough sample has been gathered, the production and formal testing of empirical data generated by this survey allows the study to be generalisable to Glasgow shops in 1997 and allow comparisons with previous and future projects of a similar nature in other research settings.

Recent methodological debates across the broad spectrum of the social and public health sciences has focused upon the seeming over-reliance on quantitative methods in health-related social research. Many commentators have now begun to advocate 'mixed-method' quantitative and qualitative approaches in order to flesh out the 'bare bones' of empirical work (see a series of seven articles on this issue in the British Medical Journal, 1995). However the methodology used depends on the question to be answered. In this study the question essentially seeks to quantify what is sold, where it is sold and what it costs. Thus we believe that a quantitative methodological approach is the most appropriate for this study.

2.1 The study site

The fieldwork setting for this study is the Greater Glasgow Health Board (GGHB) area situated in the West of Scotland, U.K. Since the dissolution of Strathclyde Regional Council in April 1996, GGHB now encroaches on four District Council areas; Glasgow, East Dunbartonshire (Bearsden & Milngavie), Eastwood, West Dunbartonshire (Clydebank). Figure 2.1 shows the location of GGHB in relation to other Scottish Health Board areas. GGHB is a large and socially heterogeneous area that contains within its boundaries a wide variety of neighbourhoods ranging from the very poorest to the most affluent.

The fieldwork location was chosen for five main reasons:

- ease of access to the fieldwork site
- good availability of local information
- results potentially useful for local policy-making
- the setting exhibits a wide range of local social circumstances
- the setting may be generalisable to other large urban areas

The GGHB area was divided into a number of distinct 'GP practice localities'. These were created in 1995 and were designed 'to bring health needs assessment closer to the community in order to deliver more effective and efficient health policy planning.' (GGHB, 1995)[1]. Each geographic GP practice locality had distinct social and demographic characteristics which, as far as is possible, try to reflect 'real areas' within the city, areas that are immediately recognisable as distinct neighbourhoods or communities. The GGHB area has a population of 987, 333 (based on the Community Health Index on the 31st March 1995) split into 19 GP practice localities. The localities had a population in 1995 ranging from 21,850 (Drumchapel) to 89,403 (Parkhead/Easterhouse). Table 2.1 displays a core range of basic descriptive variables of the GGHB area split by the GP practice localities included in the study. As this table suggests, there are a range of places within GGHB with different health profiles and

[1] Since completion of this project the GGHB locality commissioning system has been abandoned

Figure 2.1 Location of Greater Glasgow Health Board, Scotland, UK.

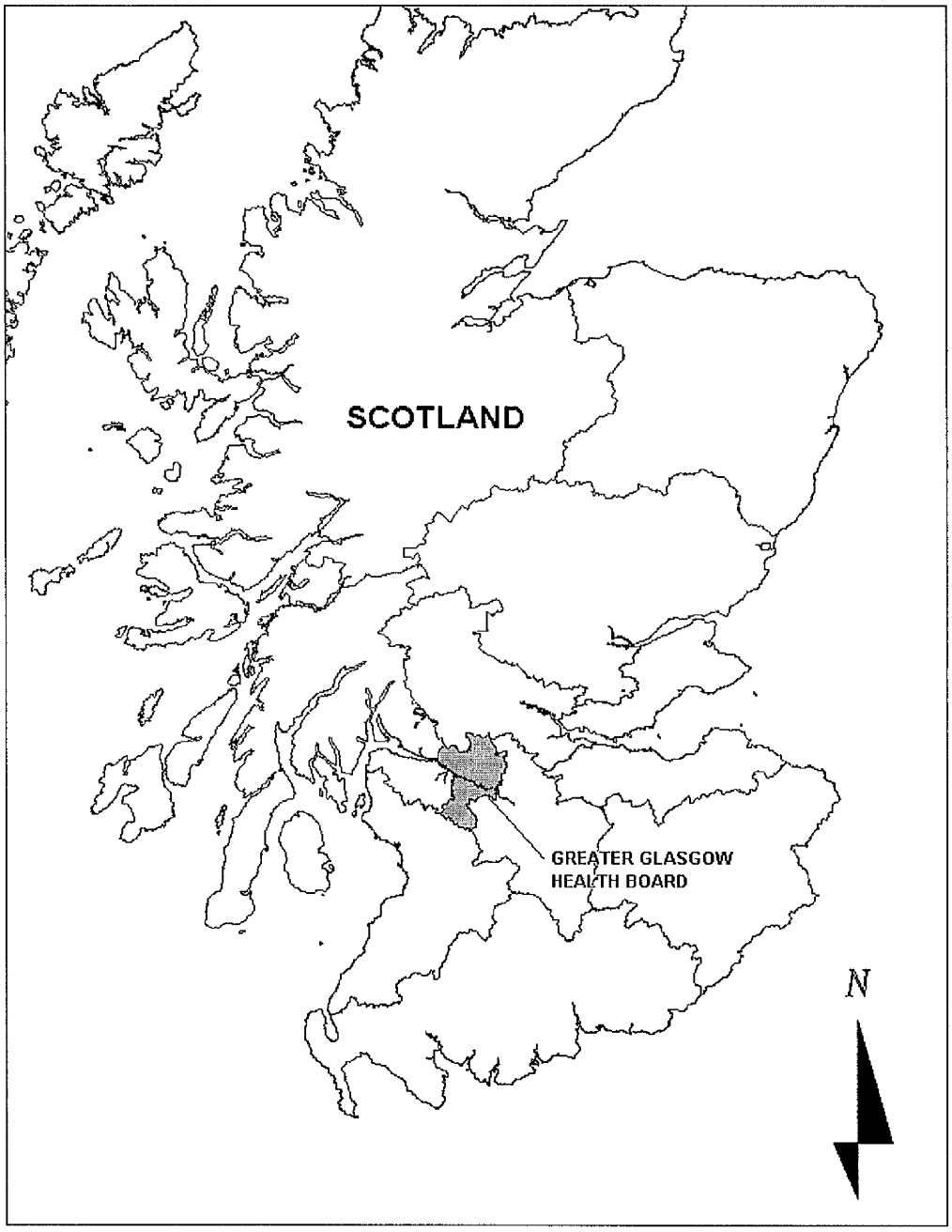


Table 2.1 A basic description of the study setting (GGHB)

Locality	**Descriptive Characteristics**		
	Pop*	**DEPCAT****	**SMR *****
Bridgeton/Townhead (E1)	40564	7	125
Shettleston/Baillieston (E2)	83596	5	113
Parkhead/Easterhouse (E3)	72354	6	100
Maryhill/Woodside (N3)	35425	6	116
Springburn/Possilpark (N4)	56169	7	113
Govanhill/Gorbals (SE1)	36144	6	105
Rutherglen/Cambuslang (SE2)	60509	5	103
Eastwood (SE3)	70133	3	74
Castlemilk/Cathcart (SE4)	60666	6	89
Shawlands/Pollockshields (SE5)	32012	4	96
Govan (SW1)	31770	7	115
Pollok/Cardonald (SW2)	86338	6	108
Bearsden/Milngavie (W1)	44222	1	71
Drumchapel (W2)	26922	7	100
Clydebank (W3)	45507	5	97
Knightswood/Yoker (W4)	60474	5	97
Partick/Hyndland (W5)	71175	4	102
GLASGOW (GGHB)******	987333		111

* Based on Community Health Index figures 31st March 1995

** Deprivation Category based on 1991 Census (1 = most affluent, 7 = least affluent)

*** Standardised Mortality Ratio (all cause, all ages, both sexes) 1992-94 (GGHB=100)

**** Standard Mortality Ratio Scotland = 100

levels of deprivation. Bearsden & Milngavie is the least deprived GGHB locality (DEPCAT 1) and also has the lowest SMR compared to the rest of the area and the GGHB average. Conversely Bridgeton/Townhead (which contains the most deprived parliamentary constituency – Shettleston - in the UK) has the highest SMR and the worst levels of deprivation. Though there is a close association with deprivation and SMR in most of the localities within GGHB there are also some exceptions. Castlemilk/Cathcart has a high level of deprivation but a relatively low SMR compared to GGHB as a whole. This may be due to the fact that the two neighbourhoods differ in their material background. Castlemilk is one of Glasgow's four post-war peripheral housing schemes and has always suffered from the problems associated with deprivation, whereas Cathcart is less deprived, though not wealthy, and may account for the relatively lower SMR. Overall GGHB has a wide variety of places within it's boundaries, making it an ideal area in which to locate a study of this nature.

2.2 Sample frame, size and selection

The survey required a sample of shops which adequately represented the full range of food retail outlet types in Glasgow. A variety of options were discussed, these included asking food retailers to supply Electronic Point Of Sale (EPOS) information or Loyalty Card data, and the researcher conducting a census of food shops from which a number would then be sampled.

In order to pursue the first option, carefully worded letters were sent to the major food retailers in Scotland. The retailers were asked whether they would be willing to furnish some sales and pricing information for selected food items on a store by store basis. It became apparent that at the company level this information was classified as being commercially sensitive. Letters were either not answered or permission to access this information was denied. However, Tesco Stores plc did provide 'unofficial' information from their Site Research Unit on how decisions surrounding store location were reached. They also provided a copy of a report by London Economics Consulting on Grocery Retailing in the UK but, as in all other cases, no further progress in accessing EPOS data was made. The second option of conducting a shop audit was rejected as being too time-consuming.

At the suggestion of a colleague, we contacted the head of Glasgow City Council planning department and asked for information on retail provision in the city. They responded by providing an up-to-date list of all existing and proposed food retail sites within their environs split by development type (food stores, mixed developments, retail developments (city centre), non-food retail warehouses) and amount of floorspace in square feet (<2000, 2001-4000, >4001). This was useful, but only accounted for the larger multiple-owned retail formats. When questioned about planning for non-multiple owned formats it was discovered that strategic consideration of these shops for planning purposes did not exist, and hence nor did records. No records would be kept unless a change of use order was sought for the retail site – which hardly ever happens as existing permits cover a wide range of retail options. The Planning Department suggested that we contact the Environmental Health department as 'most shops selling food had to comply with legislation on food safety and thus records on these stores should be kept'.

A letter was drafted in May 1996 (see appendix A1) and sent to the Director of Environmental Health, Glasgow City Council. The letter stated the aims and rationale of the project and asked for any information available on food retail outlets. It was discovered that Environmental Health kept a register of all food premises (some 5,500 shops) that operate within their administrative area, and that this register was in the public domain and available for consultation. The register is a list of all food outlets which comply with the Food Safety (General Food Hygiene) Regulations 1995 and applies to all those who prepare or sell food within a business environment.

The Public Register of Food Premises was chosen as an appropriate sampling frame for four broad reasons.

- It is comprehensive
- It is freely available
- It is centrally-held
- Lack of alternative options

The register is divided into several distinct categories, with 'retailers' being the relevant category for the purpose of this thesis. This category also contains information on food retailers which fall outside the scope of this survey such as company restaurants, school canteens and fast food takeaways, and it was decided that these would be excluded at the sampling stage.

As noted earlier since the dissolution of Strathclyde Regional Council in April 1996, GGHB now encroaches on four District Council areas; Glasgow, East Dunbartonshire (Bearsden & Milngavie), Eastwood, West Dunbartonshire (Clydebank). All four Councils were approached and asked if they would supply the Register for their respective administrative areas. Of the four district councils approached, three (Eastwood, East Dunbartonshire, and West Dunbartonshire) provided a free printed copy, while Glasgow City charged £100 for the required category. Combined, the registers, as far as is possible, give a comprehensive listing of all food retail outlets within the fieldwork location. Each register was up-to-date to the end of 1995.

2.2.1 Definition of shops used in the study

The type of shop in which a food item is sold can be an important predictor of its price and availability (Piachaud & Webb, 1996) thus it is important to note in what sorts of shops the survey data were collected. Many commentators have noted that the classification of food shops is a problematic issue for researchers who work in retail studies (Smith & Sparks, 1997, O'Brien & Harris, 1991). There are many definitions of food shops based on varied criteria including: number of shops in a retail chain, amount of floor-space, number of employees, sales per m^2 and asset values. One example is the Office for National Statistics (ONS) Business Monitor (SDM28) categorisation of food retailers. Under this schema food retailers are given the title 'Predominantly Food Stores' which are again sub-divided into 'Non-specialised Food Stores' and 'Specialised Food Stores' and again into organisation type, such as co-operative. There is a further subdivision into 'large' and 'small' retailers, with those stores generating annual sales of over £4.5 million being assigned to the former category (see Table 2.2). However, these definitions are of little practical use in this study -'official' definitions, such as this ONS classification, do not impart much information on what the character and function of a shop might be. In order to rectify this, we drew up a ten-fold classification of shops in

order to adequately describe the retail formats present in the Greater Glasgow Health Board area. Table 2.3 gives an outline and definition of the shop 'types' used in this study and is fairly self-explanatory. However the term 'multiple food store' in this study is used to include mainstream, nationally operating chains of multiple food retail outlets such as Safeway, Sainsbury, Tesco, Asda and Somerfield/Gateway. It does not include 'discounters' or 'freezer stores' which are classified separately. Within the 'independents' we did include chain outlets for bakers (e.g. Greggs) and delicatessens (e.g. Malcolm Campbell). 'Independents' in this sense means generic specialist stores such as bakers, butchers, fishmongers and delicatessen's which sell a range of particular foods or have single lines of business, or sole-owned general food stores rather than multiple food outlets which sell multiple lines of goods. In general these stores do not operate on the same scale as the large 'multiples' and thus we counted them within the 'independent' specialised sector.

2.2.2 Selecting shops for the pilot sample

In almost all social research it is important to undertake a pilot survey. A pilot survey allows testing of the study method in order to see that design and implementation is error free. It can also give the researcher an understanding of time-scales and potential problems as well as improving the efficiency and validity of the whole research process (Dillman, 1978). A pilot study can also give insight into conducting the actual fieldwork, from filling in data legibly to redesigning the data collection sheet to prevent ambiguity.

The size of the pilot sample varies depending on the needs and time available to the researcher. For the purposes of this survey there were two main aims that we hoped the pilot would achieve; firstly, to find out whether the data could be satisfactorily collected, and secondly, to test the reliability of the Public Register of Food Premises as a sampling frame. In order to do this we decided to focus on just one of the registers and visit all of the shops that met the sampling criteria. Due to the time constraints involved (and the tardy arrival of one of the registers) it was decided to focus on information provided by East Dunbartonshire District Council. This register had the advantage of being small (only 31 shops identified as being of interest to the study), representative of the shop

Table 2.2 ONS Classification of Food Retail Outlets, 1997

Predominantly food stores			
Non-specialised Food Stores *Supermarkets, Discounters, Co-Ops and Convenience Stores where sales of grocery, fresh and frozen items account for more that 50% of total retail turnover*		**Specialised Food Stores** *Includes greengrocers, bakers, fishmongers, butchers, dairies, off-licences, tobacconists and delicatessen*	
Large *(sales greater than £4.5 million)*	**Small** *(sales less than £4.5 million)*	**Large** *(sales greater than £4.5 million)*	**Small** *(sales less than £4.5 million)*

(Source: ONS Business Monitor (SDM28) adapted from Caines, 1997)

Table 2.3 Classification of Shops used in the Survey

MULTIPLES	Multiple-owned retailer	Includes all major mainstream supermarkets such as Asda, Safeway, Tesco, Sainsburys' and Gateway/Somerfield,
	Discounters	Includes operators such as Kwik-Save, Aldi, Netto and Lidl
	Freezer Stores	Includes Farmfoods and Iceland
INDEPENDENTS	Affiliated Independents	Includes Spar and other franchise operators which are run by an independent trader
	Independent Grocers/Superstores	Includes stores which sell food but are run or owned by an independent trader
	Butchers	
	Fruit & Vegetable Stores	
	Bakers	Includes 'chain' outlets such as Greggs
	Fishmongers	
	Delicatessen	Includes 'chain' outlets such as Malcolm Campbell & Peckhams
	Other	Shops which do not fit into the above categories

types in the GGHB area, and it included more than one health board. Each of the 31 shops were approached with a view to data collection (for results of the pilot see section 2.4.1).

2.2.3 Selecting shops for the main sample

The sample size required to answer a particular question should be determined by a power calculation which estimates the numbers required to detect, at a given level of significance, whether or not observed differences or associations are likely to be due to chance. In order to calculate sample size in this way two things need to be predetermined from other studies, the effect size (the amount of difference we want to detect) and the variance (the variability of any characteristic from sample to sample)(du V Florey, 1993). In this case we decided on an effect size of 10%, using previous survey and pilot results, which would enable us to detect a difference in food price of 10% between more affluent and less affluent areas. However there was difficulty in deciding what the potential variance of the sample might be, since previous surveys did not report any data from which likely variance could be inferred. Those that did used a sample size too small for a meaningful answer to be drawn. We therefore decided that after the first main set of data collection was complete we would conduct post-hoc testing of the data set to find out whether the sample contained adequate numbers to test for statistical significance, and, if not, to collect further data as required.

The sample was drawn in two stages. Firstly, all of the national 'multiples' (see table 2.2) in the Greater Glasgow Health Board area were selected (n=75). We decided that all 'multiple' stores in the fieldwork site should be included in the data set because these sorts of stores are the most important components of the food retailing system. By 1990 the five biggest multiple-owned store formats accounted for 60% of all UK grocery sales but only 3% of food retail outlets, thus the presence of just one major 'multiple' store in an area can have a profound effect on the local food economy (Wrigley, 1998, Henderson Crosthewaite, 1992).

Secondly, a random sample of 'independent' (see table 2.3) food retail outlets was drawn (n=300). The sample was achieved by combining the 4 public registers of food premises and assigning consecutive numbers to each shop (total number of shops

n=2322). A computer program was devised which generated 300 random numbers between 1 and 2322. These numbers were then applied to the register and thus the sample was chosen. After duplicates were removed (mainly multiple stores that appeared twice in the registers) a total of 325 shops were sampled.

2.3 Shopping survey design

'Shopping basket' surveys are used by a wide variety of commercial and official organisations to compare the price and availability of a range of products. These surveys are potentially very useful tools to allow approximate comparison of a range of items in different shops in different locations. 'Shopping basket' surveys are a method by which a range of items (food or otherwise) are selected to go into a 'basket' of goods. These items are determined by the goals of each study, and information (usually pricing data) on these items is collected from a range of retail outlets. A 'shopping basket' survey was chosen as the main data collection method in this case because it is the easiest and most convenient way to access the required data. Using data from official sources such as the National Food Survey (NFS) would be expensive and does not have the geographical resolution that this survey requires[2].

We considered sending a postal questionnaire to the shops identified on the Public Register of food premises. However, the potential for low response rates and the unknown reliability of the registers as a sampling frame, persuaded us that a postal survey should be rejected in favour of the researcher physically visiting each shop in order to collect the data. This had the advantage of accuracy and ensured that response rates were as high as possible by taking the burden of data collection away from the shop owner or manager.

There are difficulties with shopping basket surveys, especially those with a food component. Commentators have recognised that prices of certain foods change over time thus making direct comparisons of the most price-sensitive foods difficult (Sparks, 1996, personal communication). This may be due to a number of external factors such seasonality of foods, changing market competition, distribution problems and relative

[2] NFS data is collected and analysed by UK regions rather than smaller geographical units such as postcode sectors or wards.

food shortage and plenty. Thus data collection had to be concentrated, as far as was possible, into a short time period. Food multiples are the most susceptible to short-term price changes due to the intense price competition between different multiple-owned groups; because of this data were collected in these store formats first to try to avoid price and availability anomalies between stores in the same company. In order to persuade the shopkeeper or manager to take part in the study an information leaflet was produced to try and allay fears about the purposes for which the data would be used.

2.3.1 Design of the information leaflet

An important aspect of any study is to make sure that potential participants have all the information they need in order for them to make an informed decision about whether they would like to be included in a study. In this project a one-page leaflet was drawn up which included the following information;

- Name of the sponsors
- Nature of the survey and its purpose
- What data were to be collected
- Contact numbers if the participant has any queries about the project.

The leaflet started by explaining the rationale for the project and then gave a brief summary of what was already known about the price and availability of food. In order to interest the potential respondents, the possible benefits of the study in terms of health and social policy were stressed. The next paragraph requested the shopkeeper's help and outlined the sort of data that were to be collected. At the bottom of the leaflet a contact name, address and telephone number was given. This was particularly useful, as many shopkeepers from the smaller, independent outlets were initially wary about allowing the researcher to collect information from their store for fear of it being used by their competitors. The presence of a contact point allowed the potential respondents a 'come-back' if they had any questions about the usage of the collected data. The University Crest and the Medical Research Council logo also appeared on the sheet to give the participants reassurance that a commercial interest was not being represented (for a copy of the leaflet see Appendix A2).

As the researcher was collecting the data by hand, the design of the data collection sheet did not have to be as stylistically polished as the information leaflet. However, as Czaja and Blair (1996) point out, the data collection form needs to be understandable and clear in order to facilitate data entry and cleaning. The form consisted of a simple table in which data could be quickly and clearly written down.

2.3.2 Content of the data collection form

The Shopping Basket Survey form was three pages long and designed for completion by the researcher (see appendix A3). The information collected on the form can be divided into two main categories; general descriptive data on each individual shop, and data on each individual food item in the 'shopping basket'. In addition to this primary data, a variety of variables derived from secondary sources were also included in the final data-set (see section 2.5 for further details).

General descriptive data

A range of basic information was collected in order to make comparisons between shops, and also to control for potential confounding factors. The data collected in this section included:

- date
- opening hours
- postcode (in which shop is situated)
- health board locality (in which shop is situated)
- shop type (see section 2.2.1)
- whether ethnic food such as kosher, halal was sold

Definition of foods in the 'shopping basket' and data collected

The main element of the fieldwork consisted of the collection of data on a wide range of foodstuffs from each individual shop. Deciding on what foodstuffs to include in the survey was a time-consuming and frustrating task. Most previous, similar studies rely on a 'shopping basket' approach to collect data. Despite this continuity of approach there is still little agreement about what foods should be included (or excluded) when drawing

up a 'shopping basket'. Some surveys (or example Piachaud & Webb, 1996) have collected data on unrelated food items with which you would have difficulty in constructing a meal for everyday consumption. Other surveys have compared more and less healthy equivalents for example, normal vs. low fat sausages, white vs. wholemeal bread (Sooman & Macintyre, 1993), while still more have been nutritionally prescriptive - describing adequate levels of nutrients as opposed to types of food (Barratt, 1997). There have been very few surveys that combine nutritional adequacy with what people actually eat during a normal day or week.

As far as was possible we wanted this study to be applied and policy relevant as well as understandable and acceptable to practitioners and lay-people. It was with this in mind that we wanted to select food that made sense to an individual's everyday life without having to resort to nutrient breakdowns, neither did we wish to be too prescriptive about what people should or should not eat. Some surveys have used NACNE recommended nutrient levels (Barratt, 1997; Mooney, 1990) to assess the availability of a healthy diet. However this does tend to lead to difficulties in translating recommended daily intakes into 'whole portion' food items. We also wanted, if possible, to use a selection of foods that had already been validated.

The first 'official and validated' survey considered as a sampling frame for this study was the Retail Prices Index (RPI). The Retail Prices Index is a survey that measures the relative cost of living for a family of four, year-on-year, from an original baseline date of June 1947 (DoE, 1987). It contains a food component that was designed to reflect what a typical family might eat. Upon investigation the foods contained in the RPI were manageable in number if imprecisely defined, however the foods themselves were somewhat old-fashioned and items are updated irregularly compared to other surveys. We then turned towards the National Food Survey (NFS), a survey of household food consumption with data collected on an annual basis (MAFF 1997, Slater 1991). The NFS is a comprehensive survey identifying what foods are consumed in and outside of the home and is updated regularly. However the total number of food items contained in the NFS is far too large to be applicable to this study.

In 1993 the Family Budget Unit published a collection of papers concerned with establishing minimum budgets for 'modest but adequate' living. The collection contained papers which costed all aspects of the household budget, including the household food budget. In the words of the authors: -

> *'this costing aimed to produce a modest but adequate budget standard for food purchases that will provide enough food to satisfy the recommended intakes of all nutrients and meet guidelines for healthy eating. The suggested purchases are also intended to reflect usual purchasing patterns as far as is possible, and to be reasonably priced'* (Nelson, Mayer & Manley; 1993 p. 35)

The food budget standards were created using a variety of data sources that cross the behavioural-normative spectrum. As Nelson, Mayer & Manley (1993) state they included the *National Food Survey* (MAFF, 1985); *The Family Expenditure Survey* (DoE, 1989); *Dietary Reference Values for Food Energy & Nutrients for the United Kingdom* (DHSS, 1979) and the Health Education Authority guidelines (1987). The resulting food basket contained 57 individual food items, which were selected and weighted for nutritional adequacy, as well as representing foods that are commonly consumed. In addition the food basket had been weighted for six different family structures (see table 2.4).

It was decided that this selection of foods fitted the study requirements by being manageable, nutritionally adequate and based upon everyday household food consumption. It also had the advantage of being derived from validated and official sources and additionally provided descriptive detail allowing family composition to be taken into consideration. We also constructed nine 'food groups' which we used for illustrative purposes in Chapter 4. In basket surveys such as this, taking into account a range of shopping opportunities, missing data is often a problem. To counter this, these groups were composed ONLY of the most commonly occurring combinations of individual food items in each food group in the survey sample. The nine groups were: Breads, Cereals, Meat & Meat Products, Fish, Dairy Products, Fruit, Vegetables, Sugar & Preserves, Beverages. The constituents of each food group are shown in table 2.5.

Table 2.4 Constituents of the 'modest but adequate food basket, by family composition

	Single male	*Single elderly female*	*2 adults*	*2 adults 2 children (younger)*	*2 adults 2 children (older)*	*1 adult 2 children*
Bread						
White						
Large sliced	0	0	1	1	1	1
Small unsliced	1	0	0	1	1	1
Rolls	1	4	0	8	8	6
Wholemeal						
Large sliced	0	0	1	2	2	1
Small sliced	1	1	1	0	1	1
Cereals						
Cornflakes	0	0	500g	750g	750g	750g
Wheat Biscuits	18	12	0	24	24	0
Spaghetti (dried)	1kg/3w	1kg/3w	500g	500g	1kg/3w	0
Spaghetti (tinned)	0	0	0	1 tin	1 tin/2w	1 tin
Jam tarts	4/6w	4	4	6	8	6
Digestive bisc'ts	500g/4w	500g/4w	300g	300g	500g	300g
Choc cover'd bisc'ts	0	0	0	1 pkt	1 pkt	1 pkt
Teacakes	4/8w	4/4w	4/2w	4/2w	4/4w	4/4w
Flour	1.5kg/28w	1.5kg/28w	1.5kg/10w	1.5kg/4w	1.5kg/4w	1.5kg/7w
Meat						
Topside (lb)	0.5	0.5	0.75	1.25	5	0.5
Mince (lb)	0.25	0.25	0.5	0.5	0.5	0.5
Bacon (streaky)	4	8	12	16	16	9
Chicken (lb)	0.25	0.75	0.75	1.5	2.25	1
Meat Products						
Sausages (lb)	0.25	0.25	0	0	0.5	0.5
Frozen burgers (lb)	0	0	1	1	1	1
Fish						
Cod fillets (lb)	0	.75	.75	.75	1	0.5
Tinned tuna (med)	1	1	1	0	1	0
Fish fingers	0	0	0	250g	250g	250g
Fats						
Butter	0	0	250g/2w	250g/2w	250g/2w	250g/2w
Polyunsaturat'd marg	250g/2w	250g/2w	250g	750g/2w	750g	500g
Vegetable Oil (litre)	0.25/4w	0.5/7w	0.20/1w	0.2/1w	0.33/1w	0.2/1w

Milk						
Semi-skim (pints)	4	4	7	16	15	12
Fruit yog't (ind pot)	1	1	1	2	2	1
Cheese						
Cheddar	0.25	0.25	0.5	0.75	1	0.75
Eggs	6	6/3w	6	12	18	12
Potatoes						
New (lb)	0.5	0.75	1.5	3	4	2
Main crop (lb)	1	1.5	3	6	7	4
Frozen Chips (lb)	1/8w	1/8w	0.33/w	0.5w	0.33/w	0
Vegetable						
Cabbage (lb)	0	.05	0	1	1.5	0.5
Lettuce	1	1	1	1	1	1
Green Beans (lb)	0	0.5	0.75	1	1	0.25
Carrots (lb)	0	0.25	0.5	1	1	0.75
Cucumber	0.5	0.5	0.5	1	1	1
Tomatoes (lb)	0.5	0.5	0.5	0.75	1	0.75
Onions (lb)	0	0.5	0.75	1.5	1.5	1
Baked beans (tinned)	1 sml	1sml/4w	1 medium	1 large	1 large	1 medium
Tinned tomatoes	0.5/w	0.33/w	1	2	2	1
Frozen peas (lb)	0.33/w	0.33/w	1	1	1.5	1.5
Fruit						
Oranges (each)	2	2	4	8	8	6
Apples (lb)	1	1	1	2	2	2
Season soft fruit (lb)	0.5	1	3	3	1	1
Bananas	2	2	4	8	8	6
Sultanas	500g/4w	0	0	500g/3w	500g/3w	500g/10w
Orange juice (litre)	0.5/w	0.50/w	0.33/w	1	1	0.66/w
Sugar & Preserves						
Granulated sugar	1kg/29w	1kg/18w	1kg/5w	1kg/2w	2kg/3w	1kg/3w
Jam (12 oz)	1/7w	1/6w	1/6w	1/3w	2/5w	1/3w
Beverages						
Tea (bags, 80's)	250g/9w	250g/2w	250g/3w	250g/2w	500g/3w	250g/2w
Instant Coffee	100g/5w	100g/3w	200g/5w	100g/2w	200g/3w	100g/2w
Drinking chocolate	0	125g	125g/9w	125g/3w	125g/3w	125g/11w
Tomato soup (med)	0.33/w	2	1	1 large	1 large	1 large
Cola (litre)	1	0.5/w	2	5	5	5
Chocolate Bar	2 sml/3w	1 sml	4 sml	8 sml	9 sml	4 sml

Source: Nelson, Mayer & Manley (1993) (w = weeks)

Table 2.5 Constituents of the food groups used in later analysis

Food Group	**Constituents**
Breads	White Cut Loaf, Wholemeal Cut Loaf
Cereals	Cornflakes, Tinned Spaghetti, Dried Spaghetti, Plain Digestives, Chocolate Digestives
Meat & Meat Products	Sausages, Burgers
Fish	Fish Fingers, Tuna
Dairy Products	Full Milk, Skimmed Milk, Cheese
Fruit	Oranges, Bananas, Apples
Vegetables	Tomatoes, Carrots, Onions
Sugar & Preserves	Sugar, Jam
Beverages	Tea, Coffee, Soup & Cola

As this survey was chiefly concerned with the price and availability of food we sought six basic pieces of information relating to this issue, three of which concerned food price and availability. From these six other variables (such as price range) could be constructed. Data were collected on each of the 57 food items in the basket on a shop by shop basis.

The data collected were as follows: -

Price

- Cheapest price of a food item in a specified weight/size (irrespective of brand) Weight/size varies according to food item but was standardised for the average eg medium for tinned food, per lb/kg for fresh meat, fruit and vegetables – see Fig 2.6 for details)

- Most expensive price of a food item in a specified weight/size (irrespective of brand)

- Price of a clearly branded food item in a specified weight/size, for the purposes of direct comparison. The most commonly *available* brands of food for each applicable food item were used for the purposes of direct comparison. The presence of many conflicting (and rapidly changing) indices of the most popular brands meant that brand selection in this study would never be perfect, though after the pilot study was conducted some amendments were made to the final brand list. For some foods this approach was inappropriate as items such as meat and fish are rarely branded in the conventional sense, and were thus excluded. For fruits and vegetables the Class[3] of the product was used to indicate whether items were directly comparable. A full list of the brands used in this study can be found in Fig 2.6. It is important to note that the rise of supermarket 'own brands' now accounts for a large proportion of total food sales (up to 50%, Sparks 2001). Direct comparison between different supermarket 'own brands' is not feasible due to different quality thresholds used by each supermarket. In this study it is clear that using brands such as Heinz, as opposed to supermarket own brands, despite them being of less importance in terms of total food sales, is a trade off in terms of controlling for food quality.

Availability

- Whether food item available in a specified weight/size

- Whether branded food item available in a specified weight/size

- Whether food item available (irrespective of weight or size)

[3] The Class of a fresh fruit or vegetable is based upon a three-fold classification (I, II or III) which is used to indicate quality, Class I denoting the best and Class III denoting the worst.

Table 2.6 Weights, sizes and brands of food items in study

Generic Items		Branded Items	
White Bread (sliced)	800g	Kingsmill	Large
White Bread (unsliced)	small		
White Rolls (baps)	each		
Wholemeal Bread (large, sliced)	800g	Allinson's	Large
Wholemeal Bread (small, sliced)	400g	Hovis	Small
Cornflakes	500g	Kellog's	500g
Weetabix / Shredded Wheat	24	Weetabix	24 pack
Spaghetti (dried)	500g	Marshall's	500g
Spaghetti (tinned)	medium tin	Heinz	Medium
Jam Tarts	6/8 pack		
Digestive Biscuits	400g	McVities	400g
Digestive Biscuits (Chocolate)	400g	McVities	400g
Teacakes	1pkt of 4/6	Sunblest	4 pack
Beef (Topside)	per lb		
Beef Mince	per lb		
Bacon (streaky)	8 rashers		
Chicken breast fillets	per lb		
Sausages (pork)	per lb (454g)	Hall's	454g
Hamburgers (frozen)	4 pack	Bird's Eye	4 pack
Fresh Cod fillets	per lb		
Tuna (tinned, in brine)	medium tin	Princes/John West	Medium
Fish fingers	10 pack	Bird's Eye	10 pack
Butter	per packet	Anchor	Std
Margarine (polyunsaturated)	500g	Flora	500g
Vegetable Oil	per litre		
Full milk	per litre	Wiseman/Scot Pride	Litre
Semi - skimmed milk	per litre	Wiseman/Scot Pride	Litre
Yoghurt (fruit)	125g (sml pot)	Ski or equivalent	Pot
Cheddar Cheese	per kg	Edam	Per Kg
Eggs (medium)	half dozen		
New Potatoes	per lb	Class 1	Per lb
Old Potatoes (baking)	per lb	Class 1	Per lb
Frozen Chips	2lb bag	McCains	Per lb
Cabbage	per lb	Class 1	Per lb
Lettuce (iceberg)	each	Class 1	Each
Carrots	per lb	Class 1	Per lb

Cucumber (whole)	each	Class 1	Each
Tomatoes	per lb	Class 1	Per lb
Onions	per lb	Class 1	Per lb
Baked Beans	450 g	Heinz	medium
Tomatoes (tinned)	400g	Napolina	400g
Peas (frozen)	2lb bag	Bird's Eye	2lb
Oranges	each	Class 1	Each
Apples	per lb	Class 1	Per lb
Bananas	per lb	Class 1	Per lb
Sultanas	500g		
Orange Juice	per litre	Del Monte	Litre
Pears (or other seasonal soft fruit)	per lb	Class 1	Per lb
Sugar (granulated)	per kg	Tate & Lyle / Silver Spoon	Kg
Strawberry Jam	454g (or near wt)	Hartley's	454g
Flour	Std Bag	Homepride	Std Bag
Tea bags	250g (80s)	PG Tips	80s
Instant coffee	100g	Nescafe	100g
Drinking Chocolate	125g	Cadbury's	125g
Cola	2ltr	Coca-Cola	2 litres
Chocolate Bar	Small (65g)	Cadbury's	65g

2.4 Data Collection

2.4.1 The pilot survey

Previous work in this area does not discuss an 'optimum' method for data collection. Most shopping basket surveys depict the collection of this sort of data as a simple and straightforward exercise (Barratt, 1997; Piachaud & Webb, 1996; WCC, 1990; Mooney, 1990). The general social survey literature provides little advice on how to conduct a shopping basket survey, being primarily concerned with interview, telephone and postal techniques (Czaja & Blair 1996, Bulmer, 1984, Dillman 1978). Data collection of this nature requires a certain amount of tact and diplomacy in order to elicit the goodwill of the shopkeeper. Previous surveys have mentioned the covert collection of data (Piachaud & Webb, 1996), but in order to prevent misunderstandings we decided to seek permission from the shopkeeper prior to data collection.

Conducting the pilot survey

The pilot sample consisted of 31 shops selected from the East Dunbartonshire Public Register of Food Premises. The manager of each shop was approached by calling in person, at each place of business. The researcher then outlined the nature and usefulness of the study with the aid of a leaflet (see section 2.3.1) and permission to collect data was sought.

Each completed data sheet was dated and given a unique identification number which allowed us to clearly identify each shop when inputting and analysing the data. During the course of the pilot four shops were found to be closed and four shop owners refused access to the premises. This gave a response rate of 85.2%[4] (n=23). This varied between shop types with a low response rate of 50% for delicatessens being explained by the very small number of shops in that particular category (n=2) (see table 2.7). Response rates for all other shops were a minimum of 80%.

Table 2.7 Response rates for the pilot survey, by shop type

Shop Type	**Response**		
	Yes	No	% Achieved
Multiples	1	0	100
Discounters	2	0	100
Freezer Stores	2	0	100
Affiliated Independents	2	0	100
Independent Stores	8	1	88.9
Butchers	4	1	80
Bakers	3	0	100
Delicatessen	1	1	50
TOTAL	***23***	***3***	***85.2%***

[4] The response rate of a survey is defined as the number of eligible sample members who participate in a survey divided by the total number of eligible sample members multiplied by 100 (Czaja &Blair, 1996). In this case closed shops and those not applicable (such as chemists) were categorised as ineligible.

Changes made as a result of the pilot survey

The constituents of the 'modest but adequate' basket were amended slightly after the pilot survey. Most of the changes made were minor; for example; changing pints to litres in the case of milk, and changing items, such as seasonal soft fruit to pears. The only slightly more serious amendment was excluding green beans from the basket, as they were not commonly in season when the fieldwork was carried out (late summer). A full list of changes is given in table 2.8.

Table 2.8 Changes made to the food basket as a result of the pilot survey

Item	**Pilot (original basket)**	**Main (amended basket)**	**Reason**
Green beans	Included	Excluded	Green Beans were found to be out of season
Semi-skim milk	Measured in pints	Measured in litres	Milk is now only available in litres
Full milk	N/A	Included	For comparison of prices between full and semi-skim milk
Cheese	Edam	Generic Cheddar	Edam was used as the branded item instead.
Tea bags	PG Tips (250g)	Generic Tea (80's)	PG Tips were used as the branded item. 80 bag boxes were the nearest equivalent to 250g
Baked beans	450g size	Medium tin	The closest equivalent to 450g was a medium tin
Seasonal soft fruit	N/A	Pears	In season

In many of the stores visited shopkeepers voiced suspicions that the data collected would be used for commercial gain (a common fear being that pricing data would be used to undercut competitors in the local area). Even though this did not affect the response rate enough to cause serious problems it was felt that rates could be improved if the non-commercial nature of the project was more clearly stressed when seeking

permission to conduct the survey. One other minor change to the protocol was to carry 'official' identification bearing the Medical Research Council logo as on one or two occasions I was asked for proof of who I was.

2.4.2 The main survey

As the pilot survey had very few operational problems and achieved a good response rate, the main survey was conducted in a similar manner. Data collection was carried out over a four month period from June 1997, with most of the fieldwork occurring in July and August. The data were collected in two stages. The first stage consisted of visiting shops which fell into the 'multiples' category in order to minimise pricing discrepancies between stores in the same retail chain due to price changes in response to national and local market conditions (see section 2.3). During the second stage the 'independent' category shops were surveyed in a systematic fashion by postcode district.

A checklist of all shops in the sample was also created. Each shop had a pre-determined identification number and was ordered by postcode district. At each shop a mark was made next to the corresponding address on the checklist indicating the response of the shopkeeper. The shop identification number and name was also noted on the individual data collection sheet. At each visited outlet a copy of the leaflet was left in case of any further queries or concerns about the study.

Table 2.9 Accuracy of the sample from the public registers of food premises

	%	N	Cumulative %
Shops open	78.7	256	78.7
Shops closed	8.0	26	85.7
Not applicable	13.2	43	100.0
Total	***100.0***	***325***	

The accuracy of the Public Register of Food Premises as a sampling frame can be shown to be of a reasonable standard (Table 2.9). Shops open accounted for 78.7% (n= 256) of the sample and shops closed at 8% (n=26). The remaining 13.2% (n=43) consisted of shops not applicable to this survey (for example chemists).

Response rates for the main survey

Tables 2.10 & 2.11 show response rates by shop type and locality for the main sample. The overall response rate was 97.7 % (n=250) after ineligible shops were excluded from the sample. Overall response rates by shop type ranged from 80% to 100%, with the majority of categories recording 100% response. Response rates less than 100% were due to shopkeeper's unease that the data collected would be used for commercial or business purposes by competitors. Response rates by locality ranged from 90% to 100% and again the majority of categories recorded a 100% response.

Table 2.10 Response rates for food stores open in the main sample, by shop type

Shop Type	***Response***		
	Yes	**No**	**% Achieved**
Multiples	39	0	100
Discounters	25	0	100
Freezer Stores	11	0	100
Affiliated Independents	9	0	100
Independent Stores	96	5	95
Butchers	24	0	100
Fruit & Vegetable	20	0	100
Bakers	15	0	100
Fishmongers	7	0	100
Delicatessen	4	1	80
TOTAL	***250***	***6***	***97.7***

To the researchers' knowledge there have been no other studies of this nature undertaken in such a systematic manner, consequently it is difficult to comment on whether this level of response is adequate. However, most 'general' social surveys frequently record response rates less than that achieved by this survey (for example, the Health & Lifestyle Survey (Cox et al, 1987) achieved a 73.5% response rate). Czaja &

Blair (1996) note that response rates in face-to-face situations vary from 65%-95% hence it would be reasonable to assume that the response rates generated by this survey are more than adequate.

Table 2.11 Response rates for the main sample, by locality

Locality	**Response**		
	Yes	**No**	**% Achieved**
Bridgeton/Townhead (E1)	14	1	93.3
Shettleston/Baillieston (E2)	28	0	100
Parkhead/Easterhouse (E3)	24	0	100
Maryhill/Woodside (N3)	9	0	100
Springburn/Possilpark (N4)	19	1	95
Govanhill/Gorbals (SE1)	18	2	90
Rutherglen/Cambuslang (SE2)	11	0	100
Eastwood (SE3)	5	0	100
Castlemilk/Cathcart (SE4)	9	0	100
Shawlands/Pollockshields (SE5)	8	0	100
Govan (SW1)	10	0	100
Pollok/Cardonald (SW2)	25	0	100
Bearsden/Milngavie (W1)	12	0	100
Drumchapel (W2)	5	0	100
Clydebank (W3)	21	1	95.5
Knightswood/Yoker (W4)	11	0	100
Partick/Hyndland (W5)	21	1	95.5
TOTAL	***250***	***6***	***97.7***

Data entry, coding and preparation

The data gathered on food price did not require coding[5] however, certain variables such as 'shop type', 'locality' and data on availability were assigned codes as appropriate.

The data set was punched into SPSS for Windows by the researcher and a number of data cleaning procedures were utilised to ensure that the entries had been input correctly. The data cleaning involved using a number of range and logic checks in order to weed out any invalid or illogical values. For example, a range check program was written to ensure that no numbers entered as a shop type variable fell outside the range of shop type codes (1-10). Logic check programs were written to make sure that fruit and vegetable stores did not report selling fish, or that a price did not exist for a food item which was unavailable. Any errors discovered were then checked against the original data sheets and amended.

2.5 The inclusion of data from secondary sources

A number of independent variables derived from secondary sources were also included in the final data set in order to try and predict any variation in food price and availability. These included deprivation variables at locality and postcode district level, and population numbers at locality and postcode district level.

A note about the geographical units used in this study

Before the deprivation measures used in this thesis are discussed we need to define the administrative geography used in this thesis. There are three spatial scales upon which statistical and GIS (Geographical Information Systems) analysis is based; health board locality, postcode district and postcode sector. Health board locality has already been outlined and is described in chapter 2.1. However a note concerning the postcode geographies employed is required. Postcodes are used by the Royal Mail to easily sort and deliver letters in the UK. By assigning every address in the UK a Postcode Unit, mail can be easily sorted at collection for distribution to the relevant local and regional centres where postal workers will sort and deliver addresses to the home or business. In Scotland postcodes are used as a convenient and relatively constant geography to

[5] Coding is the assignment of numbers to responses given in a survey (Czaja & Blair, 1996)

generate spatial data from the census and other surveys and compare changes over time. This has relevance here as the area deprivation measure used in this study is based upon postcode geography. Below is a definition of the postcode terms used in this study

Postcode district – is a postal administrative unit that is signified by the first 2 or 3 digits of a 5 or 6 digit of the Royal Mail postal unit code. For example, G12 (of G12 8RJ) or G3 (of G3 6RX). Within the GGHB area there are 47 postcode districts (abstracted from McLoone & Boddy, 1994) with an average population of 18,956 (based on data from 1991 British Census) or 21,007 (based on data from 1995 Community Health Index March 1995).

Postcode sector – is a postal administrative unit that is signified by the first 3 or 4 digits of a 5 or 6 digit Royal Mail postal unit code, e.g. G12 8 (of G12 8RJ) or G3 6 (of G3 6RX). The last digit of the postcode sector always follows the space. Within GGHB there are 149 postcode sectors (abstracted from McLoone & Boddy, 1994) with an average population of 5,979 (based on data from 1991 British Census) or 6,626 (based on data from 1995 Community Health Index March 1995).

Measures of deprivation

The deprivation measure used in this project was the Carstairs-Morris Deprivation Category (DEPCAT), an area-based, seven-fold measure of relative social deprivation derived from four British Census variables; % overcrowding, % male unemployment, % low social class and % no car in postcode sectors (Carstairs & Morris, 1991). A DEPCAT of 1 describes the most affluent areas and a DEPCAT of 7 describes the most deprived. DEPCATS were calculated for postcode districts and GGHB localities in the Greater Glasgow Health Board area by using Carstairs-Morris Scores at postcode sector level derived from the 1991 British Census (McLoone & Boddy, 1994). The DEPCAT scores were aggregated up from postcode sector level data to the relevant postcode district and health board locality by calculating the average Carstairs-Morris score for the requisite geography and assigning it a DEPCAT from the pre-existing look-up table devised by McLoone & Boddy (1994). Though not originally designed to be used at a scale above the postcode sector level we needed a measure of deprivation that was relatively robust and consistent across the three geographical scales (postcode sector,

postcode district and health board locality). There are problems with constructing DEPCATS for use at larger geographies. As areas get larger there is a greater likelihood that the individuals within that area will become more heterogeneous. Thus any attempt to categorise larger and larger areas at an area level using the same criteria (in this case using census data) may mask the internal heterogeneity of that area. However for the purposes of this study, considering that the size of the areas are not too large and due to the lack of any alternative we decided to use the DEPCAT measure. The DEPCAT classification of Carstairs-Morris scores was used rather than the scores themselves, since DEPCAT is more commonly used in epidemiological and policy research in Scotland than Carstairs-Morris scores, and are more familiar to observers in social policy fields in Scotland. In chapter 5 I wanted to divide whatever spatial scale I was using into two broad categories; relatively affluent and relatively deprived. A seven point categorical classification cannot be split into two at an exact mid point, so a decision to split the classification into DEPCATs 1-4 (more affluent) versus DEPCATs 5-7 (more deprived) was made. This is a commonly used and understood split in Scottish social and health planning circles. In 1991 DEPCATs 5-7 contained 32.9% of the Scottish population and 27.9% of Scottish postcode sectors and in GGHB they included 60.6% of the population and 58.9% of postcode sectors McLoone (1994). The decision to use this division was an *a priori* one based on commonly accepted understandings of 'more' and 'less' affluent small areas, and based on a reasonable split by population size. It allows us to ask the question: is price and availability different in (what are commonly defined as) more affluent as compared with more deprived places?Population figures for GGHB Localities, postcode districts and postcode sectors were also extracted from the 1991 UK Census and were supplied by the Greater Glasgow Health Board Health Information Unit (GGHB, 1995).

2.6 Method of analysis

Within this thesis a range of sample populations were analysed for differences in food price and availability using various statistical techniques. A range of statistical procedures including the T-Test, Chi-Sq, one-way ANOVA, logistic regression and GLM were employed to analyse these data. The sample populations upon which these analyses were performed are composed as follows.

All Shops: All survey data collected in the study

Multiples: A sub-sample of 'All Shops' composed of data from stores defined as multiple-owned, discounters & freezer stores

Independents: A sub-sample of 'All Shops' composed of data from stores defined as independent grocers, affiliated independents, bakers, butchers, fishmongers, fruit & vegetable stores and delicatessens

Table 2.12 sets out how the analyses undertaken in this thesis were organised. As the table shows, the data were analysed in a systematic fashion at three geographical scales and in three sample populations for a variety of food price and availability variables.

The purpose of this section is to signpost the statistical analyses used in each chapter before the reader progresses through the thesis. The beginning of each relevant chapter deals with the analyses employed within that chapter in more detail. Thus table 2.12 describes the structure of analysis for each variable analysed, at the relevant spatial scale and from the relevant sample population – it does not go into fine detail. For example, for Chapter 4, which investigates shop type differences in food price and availability, the table shows that the 'All Shops' sample is investigated for shop type differences in the three variables outlined, mean lowest price, mean brand price and mean price range.

Table 2.12 Structure of analyses undertaken in Chapters 4 - 6

Chapter	Sample Population	Area DEPCAT Level	Variables Analysed
Chapter 4: Shop type differences in food price and availability			
	All Shops	N/A	Mean lowest price
			Mean brand price
			Mean price range
	Multiple Shops	N/A	Mean lowest price
			Mean brand price
			Mean price range
	Independent Stores	N/A	Mean lowest price
			Mean brand price
			Mean price range
	All Shops		Food groups price
			Food item available
			Brand item available
Chapter 5: Area deprivation, food price and availability			
	All Shops	HB Locality	Mean lowest price
			Mean brand price
			Mean price range
	Independent Stores	HB Locality	Mean lowest price
			Mean brand price
			Mean price range
	All Shops	Postcode District	Mean lowest price
			Mean brand price
			Mean price range
	Independent Stores	Postcode District	Mean lowest price
			Mean brand price
			Mean price range
	All Shops	Postcode Sector	Mean lowest price
			Mean brand price
			Mean price range
	Independent Stores	Postcode Sector	Mean lowest price
			Mean brand price
			Mean price range
	All Shops	HB Locality	Food item available

		Brand item available
		Pkt/Wght size available
Independent stores	HB Locality	Food item available
		Brand item available
		Pkt/Wght size available
All Shops	Postcode District	Food item available
		Brand item available
		Pkt/Wght size available
Independent stores	Postcode District	Food item available
		Brand item available
		Pkt/Wght size available
All Shops	Postcode Sector	Food item available
		Brand item available
		Pkt/Wght size available
Independent stores	Postcode Sector	Food item available
		Brand item available
		Pkt/Wght size available
Chapter 6: The relative importance of shop type, shop location and area deprivation		
All Shops	N/A	Mean lowest price
		Mean brand price
		Mean price range
Multiple Shops	N/A	Mean lowest price
		Mean brand price
		Mean price range
Independent Stores	N/A	Mean lowest price
		Mean brand price
		Mean price range
All Shops	N/A	Food item available
		Brand item available
		Pkt/Wght size available
Independent stores	N/A	Food item available
		Brand item available
		Pkt/Wght size available
All Shops	N/A	Food item available
		Brand item available
		Pkt/Wght size available

It is also appropriate here, for clarity's sake, to define each of the analysed variables' terminology in this thesis. Though the data collected (and hence raw data variables) have already been defined earlier in this chapter (see Chapter 2.3.2) it is worth outlining here what is referred to in each of the subsequent results chapters for food price. As food price is treated as a continuous (non-categorical) variable in this thesis the data are usually averaged when conducting bivariate and multivariate analyses (see below for definitions). The availability data have already been defined in Chapter 2.3.2 – as they are categorical variables, and different statistical tests were used, their definitions have remained the same.

Mean lowest price: this is the average of the 'cheapest price' independent variable across the relevant dependent variable analysed (shop type or area deprivation measure). This 'mean' is produced as part of the relevant statistical procedure used in conducting certain bivariate and multivariate analyses from the raw data.

Mean brand price: this the average of the 'brand price' (major non-supermaket own brands see Fig 2.6) independent variable across the relevant dependent variable analysed (shop type or area deprivation measure), again this 'mean' is produced as part of the relevant statistical procedure used in conducting certain bivariate and multivariate analyses from the raw data.

Mean price range: this variable is constructed from two measures collected in the sample survey, cheapest price and most expensive price. The 'price-range' variable used in the raw data-set is a product of the simple calculation 'cheapest price' subtracted from 'most expensive price' to give a crude measure of price range in each shop where data was collected. Some shops had a zero price range as some food items were identical in price or there was only one item of that type was stocked within the shop. Mean price range, as noted above, is produced as part of the relevant statistical procedure used in conducting certain bivariate and multivariate analyses from the raw data.

Statistical tests used in each results chapter

It is also worth noting here the statistical procedures used in each results chapter.

Chapter 3 uses Pearson's Product Moment Correlation (Pearson's *r*) to compare the numbers of shops in a census of shops in the whole of GGHB by DEPCAT and population. Pearson's *r* is a statistical method by which we can measure the strength and direction of a relationship between two variables. It is an appropriate test to use when the two variables are interval/ratio data. MapInfo (a GIS system) was used to describe the spatial distribution of shops in GGHB. Chi-Sq is used to compare the frequency of the shop types in the study sample by health board locality and DEPCAT. Chi-Sq is an appropriate test to use when both dependent and independent variables are categorical in nature. Cramer's V was also calculated in addition to the Chi-Sq statistic in order to test for strength of association.

Chapter 4 uses a series of one way ANOVAs (analysis of variance) to investigate differences in the various price variables by type of shop. The one-way ANOVAs were used to compare mean food price between varying shop types. ANOVA is a statistical technique in which an estimate of the *between-groups* variance (price differences between shop types) is compared with an estimate of the *within-groups* variance (price differences within shop types) by dividing the former with the latter (Bryman & Cramer, 1997). It is useful for non-categorical, parametric data where we want to compare the means of three or more unrelated samples. For the food availability data, which is categorical in nature (food available yes/no), a different test was needed. In this case Chi-Sq (χ^2) tests were used in order to compare the frequency of cases found in one variable (the food item) in two or more unrelated samples (shop type), or categories of another variable.

In chapter 5 t-tests are used to analyse price variations between more or less affluent areas. The t-test is appropriate for non-categorical, parametric data in a sample where we want to compare the means of two unrelated samples (in this case food item price in more or less affluent areas). It does this by comparing the difference between the two means with the standard error of the difference in the means of the two different samples. As in chapter 4, in chapter 5 Chi-Sq tests were used to analyse food availability data.

In chapter 6 General Linear Modelling (GLM) and Logistic Regression was used to investigate how much, and in what proportion, the variation in food price and availability can be attributed to the independent variables used in this study addressing the question: are differences in food price completely explained by shop type, shop location and deprivation? GLM is a general procedure for the analysis of variance and covariance, as well as regression. GLM assumes a normal distribution of dependent variable values in the study samples. However in the case of dependent variables in this study (e.g. mean lowest price) it becomes a rather more complex issue. If we show the unconditional distribution of values of all data in the sample, we appear to get a bimodal distribution. However, it is the conditional distribution (i.e. distribution of prices with a certain shop type), which is required for GLM. Conceptually we are dealing with the distribution of food price in different product types (low cost, normal and premium) sold in different shop types (Multiples, Discounters etc). If we consider the conditional distribution of data in these terms we can see that within each shop type there is a normal distribution of values making GLM an appropriate tool for analysis (see figure 6.1).For answering similar questions of the food availability data logistic regression was used rather than GLM as food availability and deprivation (DEPCAT) are categorical variables whereas price is a continuous variable. When undertaking a GLM analysis of food price data in this study we also have to be aware that there may be possible interactions between independent variables in the analyses. For details of whether we investigated interactions in the GLM models see Chapter 6.3.1.

Presentation of results

The analytical techniques used in this thesis generated large number of numerical tables most of which are too unwieldy to use in the main body of this thesis. To this end some of the raw results have been presented in appendices at the end of the thesis and the relevant data has been abstracted for presentation in the main body of the relevant chapter. The tables in Chapter 4 are abstracted from data presented in Appendix B.

Potential problems with statistical analysis

There are a number of potential pitfalls and concerns that have to be borne in mind in when analysing the data presented here. A limitation of this analysis concerns the large number of univariate and bivariate statistical tests of spatial data and as such the

analysis presented here must come with a health warning. Firstly, as Fotheringham & Wong (1991) explain the modifiable areal unit problem (MAUP) can be extended to this sort of data. MAUP refers to the problem of the sensitivity of analytical results in relation to the definition of spatial units for which data are collected (Openshaw & Alvanides 1998, Fotheringham & Wong 1991, Openshaw 1984). Questions can be raised about the reliability of results reported for the analysis of aggregated spatial data because the results are likely to vary with the level of aggregation (the scale problem) and the configuration of the zoning (area) system used (the zoning problem). As data aggregation increases – in this case the area-based deprivation measures used in Chapter 5 - by whatever means (ie calculating means or summing data) the process involves a smoothing effect so that the variation of a variable tends to decrease as aggregation increases – leading to lower estimates of correlation coefficients at the highest level of aggregation.

Secondly, the analytical and descriptive approach taken in this thesis (which involves 57 food items, three spatial scales, three separate price variables (lowest price, brand price and price range) and up to three breakdowns of the survey sample (all shops, multiples, and independents)) means that a large number of tests were undertaken during bivariate and multivariate analysis. The large number of tests undertaken raises the problem of Type I error, that is, incorrectly rejecting the null hypothesis. For example if we accept the possibility of error at 5% (a significance level of $p<0.05$) this would mean we would expect to find one significant relationship, by chance, for every twenty tests. A Type I error might lead us to conclude a false positive relationship, for example, that there is an association between deprivation and some aspect of food price or availability when there isn't one.

The approach taken to mitigate to this problem in the thesis is as follows. Firstly, the results presented in the relevant chapters show the actual values of the variables being compared (e.g. the mean price in pence of an item of food by DEPCAT). This allows us to examine the magnitude of any differences observed. Secondly, we have presented the significance level of the statistical tests in four categories; $p>0.05$ (not significant), $p<0.05$, $p<0.01$, $p<0.001$. This allows us to interpret the results in terms of the more stringent requirements of $p<0.01$ or $p<0.001$. Thus in order to reduce the probability of a

Type I error we can accept a higher level of statistical significance (for example $p<0.01$) as being the benchmark for a significant result. This would reduce the potential number of false positive results from 5% (1 in 20) to 1% (1 in 100). Thirdly, where it was appropriate, statistical values that give information on the strength (and in some cases the direction) of relationships were also presented in addition to the p-value (Pearson's *r*, Cramer's V and Eta Sq were used). Details on Pearson's r and Cramer's V can be found in chapter 3 and details of Eta Sq can be found in chapter 6. Thus as well as presenting and interpreting the results of the statistical tests in terms of the p values of the tests, I have also presented and interpreted the results in terms of the magnitude of any observed differences.

This chapter has outlined the design and methods used in this survey. The method of data collection was an efficient but time consuming task, and with hindsight data input could have been contracted out to allow the researcher more time on other parts of the project. This chapter demonstrates that shopping basket surveys are an easy and relatively straight forward method of collecting data on food price and availability, which achieve response rates comparable with, if not better than other social surveys. However there are a number of limitations (as outlined above) that need to be borne in mind when conducting this sort of study.

Chapter 3: Food Retailing and Food Choice

Before reporting the results of this study it is important to describe the characteristics of the survey sample. How are the shops distributed? How similar are localities in terms of their retail mix? What type of shop is the most common? What are the implications of these questions for accessing an adequate diet?

This chapter begins by reviewing the role of the retailer in shaping food choice since the 1980s, documenting the rise of the 'multiple' retailers and their influence on the food production and distribution system, and suggesting how changes in UK retail structure might have had an impact on food price and availability. It then compares the characteristics of the study sample with current Glasgow, Scottish and UK food retailing patterns.

3.1 Food Retailing and Food Choice in Britain

Food retailing plays an important role in shaping individual food choice in the UK. During the last twenty-five years changes in the structure of the food retailing industry, food distribution, marketing and the development of new and innovative foods have changed the ways in which individuals select and consume food. The single most important catalyst for these changes has been the rise of the 'multiple' retailers such as J Sainsburys', Tesco and Safeway as 'channel captains' - those who dominate the channels through which food flows from production to plate - of the food economy. As Wrigley (1998) has noted, these organisations can be seen to be exploiting an increasingly oligopsonistic[1] buying position from manufacturers. As the Competititon Commission (2000) reports, in 1998/99, multiple owned superstores (include co-operative societies) between them controlled over 7100 grocery stores in the UK, additionally, the grocery food market in the UK was estimated to be worth over £90 billion in 1998.

[1] Oligopsony is a market which is dominated by few buyers (Wrigley, 1998a)

Changes in British retail structure

Grocery stores were being organised into multiple chains since the late nineteenth century, and their growth at the expense of single independent stores has been increasing ever since (Seth & Randall 1999). From the 1950s there was continuing growth of self-service stores and supermarkets with more and more sales from stores organised into chains. In the UK the total number of firms in the food retailing sector has been declining, primarily due to the closure of smaller, independent shops. Table 3.1 clearly illustrates this decline as well as a corresponding rise in the number of multiple-owned firms. Table 3.1 also clearly shows that the pace of decline was particularly marked in the 1970s with a 42.7% decrease in number of food stores with one outlet during a nine year period (1971 – 1980) compared to a 32% in a twelve year period (1980 – 1992). This is another clear indication that the rise of the multiple retailers, particularly during the late 1980's and 1990's (Wrigley 1987, 1996, 1998a) did not correspond with the period of greatest decline in the number of small shops.

Dawson (1995) suggests that there are many social, economic and political reasons for this decline in the number of small stores. Smaller firms do not have the resources to source products as effectively as large ones and consequently are unable to offer lower prices through economies of scale. Smaller firms also do not have the resources needed to install modern information technology such as Electronic Point of Sale (EPOS) systems which generate detailed information about the buying patterns of their customers and facilitate increases in stock efficiency. Much of the smaller operators' capital is tied up in physical property and is not easy to release for investment purposes. A host of other problems can be associated with small firms and their owners such as generally lower managerial skills, location, format, poorer physical condition of the shops, higher operating costs and a lack of marketing expertise, all of which contribute to higher levels of closure. However Guy (1996) suggests that closures may not just be due to the oft-assumed causal link between the arrival of larger retailers, with their greater resources, and the closure of independent shops. Other contributing factors such as overtrading, changes in personal or company policies, retirement of shop owners or population or market changes in the local area may also contribute to a decline in the number of small shops.

However this is not to say that the small food shop has ceased to be a viable option. Small shops have survived by implementing a variety of commercial strategies such as being part of a larger buying group, joining a wholesaler-sponsored voluntary chain with group marketing functions and support activity (so-called 'symbol groups' or 'affiliated independents' such as Spar), or by seeking refuge in niche markets (Dawson 1995, Caines 1997). The consequences of changes precipitated by the rise in numbers of multiple-owned stores, and their effects on retail structure for consumer choice and the price and availability of foods, will be discussed in the next section.

Table 3.1 Changes in the structure of food retailing in the UK

No. of businesses	1971	1980	1984	1990	1992
Total	162,300	90,475	81,680	65,169	60,119
Large grocers		114	98	78	71
Other grocers	95,500	43,396	34,053	21,489	18,557
Butchers	22,800	16,613	16,295	13,137	12,149
Greengrocers	28,300	14,380	15,119	11,815	10,622
Fishmongers	4,900	2,411	2,638	2,444	2,122
Bakers	6,500	6,277	5,523	5,177	4,006
Number operating					
1 outlet	142,800	81,835	74,422	59,238	55,416
2-9 outlets	18,950	8,309	7,031	5,757	4,554
10-99 outlets	482	289	196	159	133
100 and over outlets	55	42	31	15	16

Source, Dawson (1995), p.84

3.1.1 British retailers and food choice

Commentators such as Wrigley (1998a), Dawson (1995) and Henson (1992) have suggested that there are two main ways in which 'multiple' British food retailers have influenced consumer choice. First, through shaping the range and type of food products on offer and secondly, through altering the access different groups of consumers have to the food supply chain through the re-organisation of retail space.

Food retailers, food products and food choice

The concentration of retail capital through merger and acquisition was one of the defining characteristics of change in the 1980s food retail system (Wrigley 1987, 1996, 1998a, Guy 1994, Henson 1992). Henderson Crosthewaite (1992) note that by 1990 five retailers controlled over 60% of the grocery trade and over 40% of the more broadly defined 'food market' (which includes specialist outlets such as chemists and organic food stores). This concentration of ownership and market share has increased the buying power of the major retailers allowing them to bypass the wholesaler and move directly to dealing with food manufacturers. The end result of this process has been that manufacturers are now increasingly dependent on retailers in that they control access to the principal routes to market (Foord, Bowlby & Tillsley 1996), and as a consequence "..UK retailers have tried to enforce rather despotic logistics and pricing demands on manufacturers in their relationships.." (Hughes 1996, p.99).

Coinciding with the concentration of retail capital, the major food retailers also began to exert more control by reorganising the supply chain. Up to 90% of retailers' products are now distributed through a network of regional distribution centres (RDCs), which are climate controlled and strategically positioned (Fernie, 1992 in Wrigley, 1998a). The development of RDCs was in response to manufacturer transportation which could not cope with the requirements of multiple owned retailers who wanted to increase the efficiency of the distribution network. Raven, Lang & Dumonteil (1994) note that by 1992, 97% of Safeway's product volume was transported through its twelve RDCs. The development of RDCs has had the effect of significantly reducing the inventory levels of food retailers (and therefore the amount of capital tied up in them). This had a net effect of stock being driven out of the system – though this was also partly due to increases in manufacturer efficiency (Seth & Randall 1999). By the early 1990s stock levels for fast

moving, short shelf-life products, such as milk, were effectively nil (Fernie, 1994), though one negative side effect of the development of RDC's was the need for more vehicle trips in order to distribute food efficiently (NPI 2000).

What were the main implications for individual food choice of these changes in the market place? Wrigley (1998a) identifies as a key trend of significance to consumer choice, the rise of retailer brands and as a consequence the development of a chilled ready-meals market. Own-branded goods were effectively repositioned as 'retailer' brands (such as Marks & Spencer) in order to build associations with quality and price (Burt 1992) and have since become the equal to if not better that established manufacturer brands (Burt 2000). Retailer brands, as Hughes (1994) notes, accounted for around 36% of the 'packaged' grocery market in the UK (or 48% when perishables are included) by the early 1990s. These brands played an increasingly important role as they allowed experimentation with new products and also developed customer loyalty by repositioning these own-labels as retailer 'brands'. Retailers could use own-labels to fill gaps left by the manufacturer, enhancing broader market development and innovation. Chilled ready-meals are a classic example of retailer-led innovation which food manufacturers simply did not identify. The chilled ready meal sector simply had no manufacturer capacity as a basis for brand supply so retailers (particularly Marks & Spencer) were forced to create their own supply chains in the absence of pre-existing organisational alternatives (Wrigley 1998b). This had a profound effect on the food choice habits of certain socio-economic groups of consumers in the UK. The employment of food economists and technologists became even more critical (Senker 1986). Sparks (1997) uses Tesco's healthy-eating campaign of the mid-1980s which ushered in nutritional labelling on own-brand foods, as an example of a benefit to individual food choice. These own-brands began to rise in quality and were able to compete directly with established brands such as Heinz & Birds-Eye (Hughes, 1996). The big retailers were therefore able to pass on the price benefits to the consumer, allowing them, if they chose, to reduce their weekly food bill.

Food retailers and the re-organisation of retail space in the 1980s and early 1990s

Changes in the way in which food was delivered to the consumer was the most important facet of retail change to impact on food availability. As explained in the

previous section the 1970s and to a greater extent the 1980s saw a radical reorganisation of retail space as large firms began to compete by using capital intensive forms of competition through investment in fixed assets such as property (Guy 1994, 1996, Wrigley 1996, 1998a, 1998b).

The building of food superstores became a feature of the 1980s food retail explosion – a period which was dubbed the 'store-wars' era (Wrigley 1994). The greater economies of scale afforded by increased store size allowed profit margin increases through lower wage and distribution costs as a percentage of sales, greater returns per sq. ft., wider product ranges and higher spend per individual customer visit (Shaw et al, 1989). This subsequent increase in overall profits per store proved to be the main engine of growth allowing further investment in large superstores. By the late 1980s and early 1990s intense competition over a finite number of suitable development sites heightened land prices and therefore raised start-up store costs to as much as £25 million in parts of the South East of England (Wrigley 1998a, Moir 1990). As a result of these changes food supply began to decentralise out of urban areas to locations at the edge or out of town, or on purpose-built retail parks capable of delivering the economies of organisational scale sought by the multiple retailers.

This retail revolution had a significant effect on the accessibility of shopping facilities to different groups of consumers. As the traditional food shopping centres of British cities began to decline, there was a corresponding decrease in the number of small shops in these traditional locations. Cliff Guy's (1996) study in Cardiff, Wales, demonstrated that the opening of seven edge-of-town superstores in the mid-1980s brought an almost simultaneous wave of small food store closures, especially in inner city and suburban areas. However, Guy stresses that 'trading impact' (small store closure as a direct result of large multiple openings) is often too simplistic a diagnosis for the demise of the small shop and other factors may have affected or hastened small shop decline, such as changes in local markets, population structure and consumer demands of the local population. The trend for traditional town centre decline continued throughout the 1980s and early 1990s leaving many British urban areas with so-called 'food deserts' (Mansfield (in The Big Issue)1996). The lion's share of the food choice and price benefits of edge and out-of-town food retailing centres went to the more mobile, car-

owning, affluent consumer. This had the net effect of creating groups of 'disadvantaged consumers' – usually the elderly, the disabled, lone parents, the unemployed, those without cars and the sick and infirm who were excluded by mobility problems from participation in the modern food economy (Bromley & Thomas 1993, Westlake 1993). The existence of mobility disadvantage was confirmed by Rees (1988) who showed that 87 percent of car-owning households focused their shopping around one grocery superstore compared to 47% of those households who lacked a car; thus car-less households were less able to take on the price and availability benefits of one-stop shopping. These concerns and debates, coupled with escalating media interest, ultimately lead to increasingly tight land-use restriction policies which began to limit development of these edge-of-town sites in the mid-1990s. This came to be known anecdotally as the 'Gummer effect' after the then Conservative environment minister John Gummer who was responsible for the introduction of more restrictive planning legislation for food superstores.

UK retailing in the late 1990s: rise of the discounters and a return to the high street

The 1980's retailing environment was thus chiefly characterised by capital-intensive investment and an increasingly retailer-led domestic food supply and distribution network. By the 1990s the conditions which sustained this type of growth had begun to fade away (Wrigley, 1991). As a consequence, as Burt & Sparks (1994) and Wrigley (1994) demonstrate, in the early 1990s the major retailers were suddenly vulnerable to a two-pronged attack on their market supremacy. Firstly they were susceptible to operators who concentrated on heavy price discounting and offered a limited range of goods; secondly they had left the traditional centres of food retailing – central and neighbourhood shopping district areas - without any food retail presence. The pursuit of efficiency and the increase in store size to generate higher profit margins ironically left these areas resembling an underexploited market. Two relevant developments with implications for individual food choice arose out of these vulnerabilities and are detailed below.

First, UK food retailing saw the entry of European limited-line deep discounters such as Aldi, Netto and Lidl - though it is often forgotten that Shoprite, a UK company, pioneered discounting in the UK (Sparks 1995). The existing British multiples were, at

first, not worried about the entry of these firms 'the discounters had entered a sub-sector of the market...with direct price-competition effects being unlikely to cross the market segment boundaries' (Wrigley 1996, p123-124). However, their impact was felt in the second tier of food retailing which then sent ripples throughout the whole industry, beginning a round of intense price-competition which hit the profit margins of all food retailers. The price of certain core foods went in a downward spiral (consider the case of baked-beans – reaching 3 or 4 pence per tin in some stores), particularly in urban areas of the North of England and the Midlands (Wrigley 1998a, Sparks 1996, pers. comm.). The major retailers responded by sacrificing quality to develop ranges of core foods (such as breads, cereals, meats and certain tinned goods) at discount prices, using discrete brands such as Safeway Savers, Tesco Value and Sainsburys' Essential ranges in order to compete with the discounters on price. Though lower in quality than traditional own-label goods the price benefits to the consumer offered by these ranges and a rise in the number of discounter retailers are obvious.

Second, the impact of the 'Gummer' effect – the tightening of land-use planning regulations through Planning Policy Guidance Note 6 (PPG 6) Shopping Centres and their Development (DoE, 1993) and PPG 13 on Transport (DoE, 1994) - towards a more sustainable development agenda actively discouraged out-of-town development and provided an impetus for a return to the high-street in food retail development (Wrigley, 1998b). The way in which this has been achieved is the subject of debate. Briefly, one line of argument goes that a return to the high street was directly prompted by PPGs 6 & 13 and the symbolic refusal of planning permission for large centres in the South of England. The other suggests that there was a straightforward response to recent market changes and the reassessment of locations previously thought to be unprofitable, together with innovative market development into non-food areas such as banking and media products (Wrigley, 1998b). Whichever of these is correct, the fact remains that the major retailers returned to central locations through 'neighbourhood' or 'compact' style outlets, such as Tesco Metro (Tesco Annual Report, 1995). These stores were typically 15 – 20,000 (or as small as 5 - 12, 000) sq. ft. in size with a smaller, more own-brand, product range than would usually be found in larger stores. Food retailers have now begun to reassess other, previously undesirable or viewed as unprofitable, central and neighbourhood sites within towns and cities and are increasingly bringing some of

the price, food-choice and availability benefits to some consumers previously disadvantaged by mobility and geographical location during the 'store-wars' era of the 1980s. However it has been noted (Competition Commission 2000) that some of these new stores are now increasingly resembling outlets for top-up shopping only, selling fresh produce and high value ready and pre-prepared food only, thus catering for a discrete group of consumers which may necessarily be among the more affluent.

3.1.2. The Scottish Grocery Market

The restructuring of food retailing in Scotland has, for the most part, mirrored the wider British experience of the 1980s. However, in the early to mid-1990s the Scottish grocery market evolved in a different way when compared to the food retail economies of England and Wales. This section briefly describes the process of retail restructuring in Scotland and discusses its implications for consumer choice and the price and availability of food from a Scottish perspective.

The national picture

Dawson (1995b) and more recently (Dawson 2000) in a review of retailing in Scotland, suggests that there are four trends peculiar to the Scottish market. First, he notes that Scotland has recently experienced a much faster rate of market concentration when compared to the rest of the UK, a reversal of previous trends. Dawson notes there has been a polarisation of retail formats with investment occurring in both large and small stores, with a net increase in total food retail floorspace to over 3 million sq. ft. in 1995. Secondly, inter-format competition is increasing more strongly than inter-firm competition. This has implications for governmental policies on land-use regulation as well as for what forms of price and promotion policy will be developed by retailers in the Scottish market. Thirdly, few of the major retail decisions are being made in Scotland. This will have knock-on effects in terms of levels of managerial employment, locational allocation of profits and the sourcing of products sold in Scotland. Finally, there is real danger that there will be a reduction of locally based innovation in the Scottish market. As more head offices are located in England, indigenous innovation will increasingly suffer as a result.

Table 3.2 Grocery retail operators in Scotland (1995)

Company	Number of Stores	Scottish Market Share (%)	UK Market Share (%)
Asda	27	15.5	11.2
Co-Op movement	170	12.6	8.2
Somerfield	51	8.7	7.0
Safeway	61	16.6	9.0
Presto	122	2.9	0.5
J Sainsbury	4	4.9	21.0
Tesco	61	15.3	19.2
Kwik-Save	106	7.8	6.7
Other multiples	N/A	1.2	7.6
Independent/Symbol Groups	N/A	14.5	9.6

Source, Fernie & Woolven (1995) p24

In the period up to the mid-1990s Fernie & Woolven (1995) showed that the Scottish grocery market was being increasingly concentrated into the hands of 6 major multiple retailers: Asda, Argyll group (owner of Safeway and Presto), Tesco, J Sainsbury, Somerfield and Kwik-Save. Together, these retailers controlled around 72% of the Scottish market in 1995 and, as Table 3.2 shows, the hierarchy of operators differs to that of the UK as a whole. In Scotland the Argyll group was the leading retailer through its Presto and Safeway formats (over 19% combined market share compared with just 9.5% in the UK as a whole). Safeway has strong traditional ties with Scotland, and its chairman at the time (Sir Alistair Grant), himself a Scot, used this as a distinct part of the company marketing strategy. The Co-Op movement, then still a well established and important company (12.6% market share), also has a long history of trading in Scotland as Fernie & Woolven (1995, p.24) note "it (the Co-Op) has a particularly loyal customer base which is partly due to its (socialist) ethos and culture which has political expression in many Scottish communities". The Co-Op's 170 stores range from sophisticated superstores to small convenience outlets and have recently begun to behave like other multiples through the Co-operative retail trading group (CRTG) with increasingly centralised buying and marketing functions.

The traditional English retail heavyweights, Tesco and Sainsbury, had a comparatively small presence in Scotland preferring to concentrate their efforts in England and Wales. However in 1994, a watershed year for the restructuring of Scottish retailing, Tesco succeeded in purchasing Wm Low, a Scottish regional chain with 45 stores in Scotland and a few outposts in northern England. This gave Tesco a far quicker market penetration in Scotland at a time when planning consent for large stores was looking increasingly unlikely due to a tightening of planning legislation (the Scottish equivalent to the 'Gummer effect'). Although Sainsbury made a counter bid, Tesco revised their offer and it was accepted by Wm Low. This had the net effect of doubling Tesco's market share ensuring an instant place amongst the top 3 grocery retailers in the Scottish food economy (Sparks 1996b, Fernie & Woolven, 1995). During the same year Kwik-Save acquired Shoprite, at the time Scotland's key limited line discounter. Shoprite had grown rapidly since its inception in 1990 to having 108 stores by October 1994 (90 of which were based in Scotland) compared with Kwik-Save which, after a late entry, was trading from only six stores. However Shoprite's rapid expansion highlighted the market potential for discount stores and speeded the response, not only of Kwik-Save, but also of the European limited line discounters such as Aldi, Lidl and Netto (Sparks, 1995). As new retailers entered the market and existing ones extended their business, trading conditions became much harsher and as a result, in May 1994, Shoprite began to experience a sharp fall in profits despite an increase in sales. During 1994 three profits warnings were issued and Shoprite's share price collapsed. In November 1994 Kwik-Save stepped in with an offer of less than £0.5 million a store (a good price compared with an average £1 million in new store start-up costs), all of which were then converted to the Kwik-Save format (Sparks, 1996b).

During the late 1990's the rate of opening of new food stores in Scotland slowed but there has been a large increase in the amount of retail floorspace. Table 3.3 shows this trend for the six major food retail firms in the UK - unfortunately Scottish specific data is not available (Dawson 2000). Much of these developments have been part of the development of large, loosely linked food and non-food retail units (retail warehouse parks) at a single location which characterises the store development in the late 1990s. Dawson (2000) notes that a number of these have become 'Power Centres' which have often incorporated a more cohesive and design led approach, often coupled with the

presence of leisure facilities such as cinemas and bingo halls. New shopping centres incorporating food and non-food outlets have also opened during the late 1990s after several years of planning and development, for example Braehead and Buchanan Galleries in Glasgow. This has resulted in greater concentration in the food retail sector, in 1999 the five largest grocery organisations accounted for 75% of total grocery sales in Scotland, up from 63% in 1994.

Table 3.3 UK sales (£ million) and sales per sq. metre (£) by major food retailer

	1996	**1997**	**1998**	**1999**	**Ave Store Size (Sq. m) 1999**	**% Increase in space 1996-99**
Tesco	10,216	10,940	11,790	11,712	2,336	19.2
J Sainsbury	11,367	11,417	11,646	11,617	2,636	16.6
Savacentre	7,771	8,299	8,257	8,367	8,045	17.9
Safeway	7,731	8,163	8,419	8,775	1,973	16.1
Somerfield	6,084	6,635	6,384	6,178	941	35.8
Marks & Spencer Food	10,631	10,910	10,742	10,127	948	-
Grocery Sector Total	*73,601*	*77,435*	*81,327*	*84,194*	-	-

(Source Dawson 2000, p5)

Though this description focuses mainly on the large multiple-owned groups, specialized stores, such as Iceland Frozen Foods and Farmfoods, have done comparatively well in the Scottish context. This reflects market research (CACI, 1994) which has found that when asked if freezer stores were an important shopping option Scottish consumers were more likely to rate them as important than the British average (58.1% compared to 49.4%). Independent stores are much more important in Scotland than in the rest of the UK. The polarisation of retailing from the 'one-stop shop' ethos of superstores to the 'convenience' format used for topping up weekly purchases is much more prevalent in Scotland (Fernie & Woolven, 1995). Symbol groups, such as Spar, and independent

grocers have a much larger share of the Scottish grocery market than the average for Britain as a whole (see table 3.2). Outside of the central belt area, independent stores are often the only shops available and they tend to be larger than the British average in order to carry a greater range of goods. A strong wholesaling sector has developed in order to supply both urban and rural areas with companies such as Watson & Phillips in Dundee (who have since moved into retailing through the Alldays convenience store format) remaining important.

Glasgow's Retail Structure

There is little published work explicitly concerned with Glasgow's food retail structure. However we can use information from local council planning and environmental health departments to briefly describe how the food retail space of Glasgow is organised. To recapitulate, shops included in this description were those that fell into the 'food retail' category assigned to it by the constituent councils which fall into the Greater Glasgow Health Board area. Information was gathered from the Public Register's of Food Premises shows that there are 2304 food retail outlets registered as complying with the 1995 Food Hygiene Act in the Greater Glasgow Health Board Area.

In this section Pearson's Product Moment Correlation (Pearson's *r*) is used to measure the strength of relationships between interval/ratio variables. Pearson's *r* allows the strength and direction of a linear relationship between variables to be gauged. Pearson's *r* varies between -1 and +1. A relationship of -1 or +1 would indicate a perfect linear relationship, negative or positive respectively, between two variables. The complete absence of a relationship would be indicated by an *r* value of 0 (Bryman & Cramer 1997). The nearer an *r* value is to 0 the weaker a relationship is. It has been suggested that the following can be used as a rule of thumb: <0.19 is a very weak relationship; 0.20-0.39 is weak; 0.40-0.69 is modest; 0.70-0.89 is strong and 0.90-1 is very strong (Cohen & Holiday in Bryman & Cramer, 1997). The statistical significance (p value) of the test is also always reported with *r*.

Table 3.4 describes the number of shops available per head of population for GGHB Localities. Health Board Localities classified as more deprived tend to have more shops per 1000 population. Using Pearson's Product Moment Correlation (Pearson's r) we can

see that there is a statistically significant positive relationship (r= .496, p=. 043), with more shops per 1000 pop in more deprived areas. However, the relationship is a modest one, and detailed inspection of the scattergrams suggests that it is mainly due to outliers in the data set (shops per 1000 pop in Bridgeton/Townhead, Bearsden/Milngavie, Eastwood). With these three cases removed from the analysis, there is a non-statistically significant weak negative relationship (r= -.274, p=.343) between deprivation of health board locality and shops per 1000 population. However we should note the small sample size (n=17 or n=14 excluding the outliers) which means that any relationships are best described as inconclusive.

Table 3.4 Number of food retail outlets per 1000 population in GGHB Localities

Locality	Descriptive Characteristics		
	Pop*	**DEPCAT****	**Food Retail Outlets per 1000 pop**
Bridgeton/Townhead (E1)	40564	7	6.5
Govanhill/Gorbals (SE1)	36144	6	3.8
Govan (SW1)	31770	7	3.7
Clydebank (W3)	45507	5	3.3
Partick/Hyndland (W5)	71175	4	3.3
Shettleston/Baillieston (E2)	83596	5	2.9
Shawlands/Pollockshields (SE5)	32012	4	2.9
Rutherglen/Cambuslang (SE2)	60509	5	2.6
Maryhill/Woodside (N3)	35425	6	2.4
Springburn/Possilpark (N4)	56169	7	2.4
Knightswood/Yoker (W4)	60474	5	2.2
Parkhead/Easterhouse (E3)	72354	6	2.0
Castlemilk/Cathcart (SE4)	60666	6	2.0
Pollok/Cardonald (SW2)	86338	6	1.9
Drumchapel (W2)	26922	7	1.6
Bearsden/Milngavie (W1)	44222	1	0.7
Eastwood (SE3)	70133	3	0.5

* Based on Community Health Index figures 31st March 1995

** Deprivation Category based on 1991 Census (1 = most affluent, 7 = least affluent)

Figure 3.1 describes the spatial distribution of food retail outlets in GGHB by population density at the postcode sector level. There are shops located in almost all postcode sectors with the exception of the northern part of the city (Strathkelvin). Areas with the highest density of population (darker areas on the map) correspond with areas with the greatest numbers of food retail outlets (larger red spots). Areas with the greatest numbers of shops tend to be located nearer the centre of Glasgow City in the West End, Shawlands and the City Centre, and those areas with the fewest shops are located towards the south and east of the GGHB area. The furthest south-eastern reaches are the

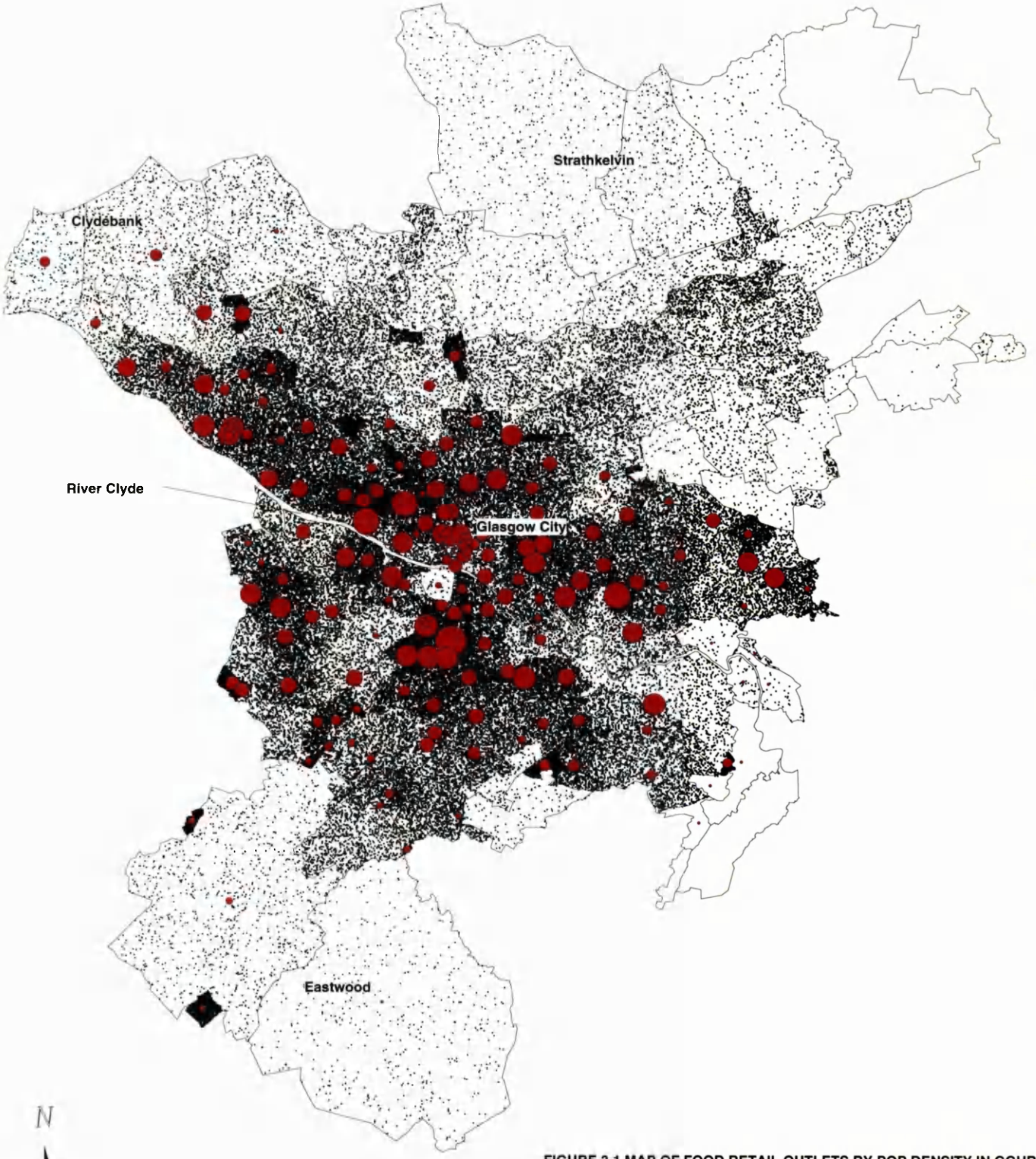


FIGURE 3.1 MAP OF FOOD RETAIL OUTLETS BY POP DENSITY IN GGHB

most rural, and shops that are located there tend be right on edge of their postcode sector boundaries, nearer the more populous areas. The Strathkelvin area is devoid of food shops. This may be due to the rural and semi-rural nature of these places or a possible council administrative problem with collecting information on food outlets from these areas.

Analysing the data in Fig 3.1 using Pearson's *r* we can see that there is a weak, though statistically significant, positive relationship between population and number of shops at the postcode sector level (r=. 239, p=. 003). This indicates that the greater the numbers of people residing in a postcode sector the more shops are located within that postcode sector. Data reporting problems from Strathkelvin mean we need to be cautious about the robustness of the finding.

Figure 3.2 is a map of food retail outlets in GGHB by level of deprivation (DEPCAT) at the postcode sector level. This map demonstrates that the more affluent areas located on the fringes of GGHB are not as well served for shopping opportunities as is the centre. In central areas of GGHB there are large number of retail outlets (proportionately represented by the red circles). Poor areas (as indicated by the darker shades of green) do not seem to be at any particular disadvantage, and from this map it would seem that more affluent areas such as Eastwood, Bearsden, Milngavie and rural Strathkelvin suffer from a relative lack of local food retail outlets. There is a highly statistically significant, though modest, relationship between DEPCAT and number of shops at the postcode sector level (r=. 445, p= .000), there being more shops in more deprived postcode sectors. This may not, however, be a problem as car-ownership (a component of the DEPCAT measure) is likely to be high in these affluent areas, allowing residents to travel to the shopping facilities they wish to use.

One of the many complaints of residents of poor neighbourhoods is the lack of 'multiple-owned' supermarkets and superstores within their local areas (Killeen, 1992). Figure 3.3 shows a map of 'multiple-owned' stores only (encompassing supermarkets, discounters and freezer stores) by postcode sector DEPCAT in GGHB. The purple stars refer to the number of 'multiple-owned' stores in each postcode sector. The location and distribution of these multiple owned outlets mirrors that of the general distribution

of all food retail outlets shown in Figures 3.1 and 3.2, with the most affluent areas on the fringes of GGHB having few or no multiple-owned supermarkets. What is interesting to note here is that the poorest areas of Castlemilk, Drumchapel, Easterhouse and Darnley (Glasgow's peripheral housing schemes) all have 'multiple-owned' supermarkets with their peripheries. Much work on 'food deserts has focussed on these sorts of places as areas most in need of enhanced (meaning multiple-owned) shopping opportunities but this does not seem to be an issue in Glasgow – though of course this does not suggest that all residents have the resources with which to purchase the foods on offer. There is a statistically significant though weak positive relationship (Pearson's r =. 191, p=. 019) indicating multiple-owned stores (multiples, discounters, freezer stores) are more prevalent in more deprived postcode sectors

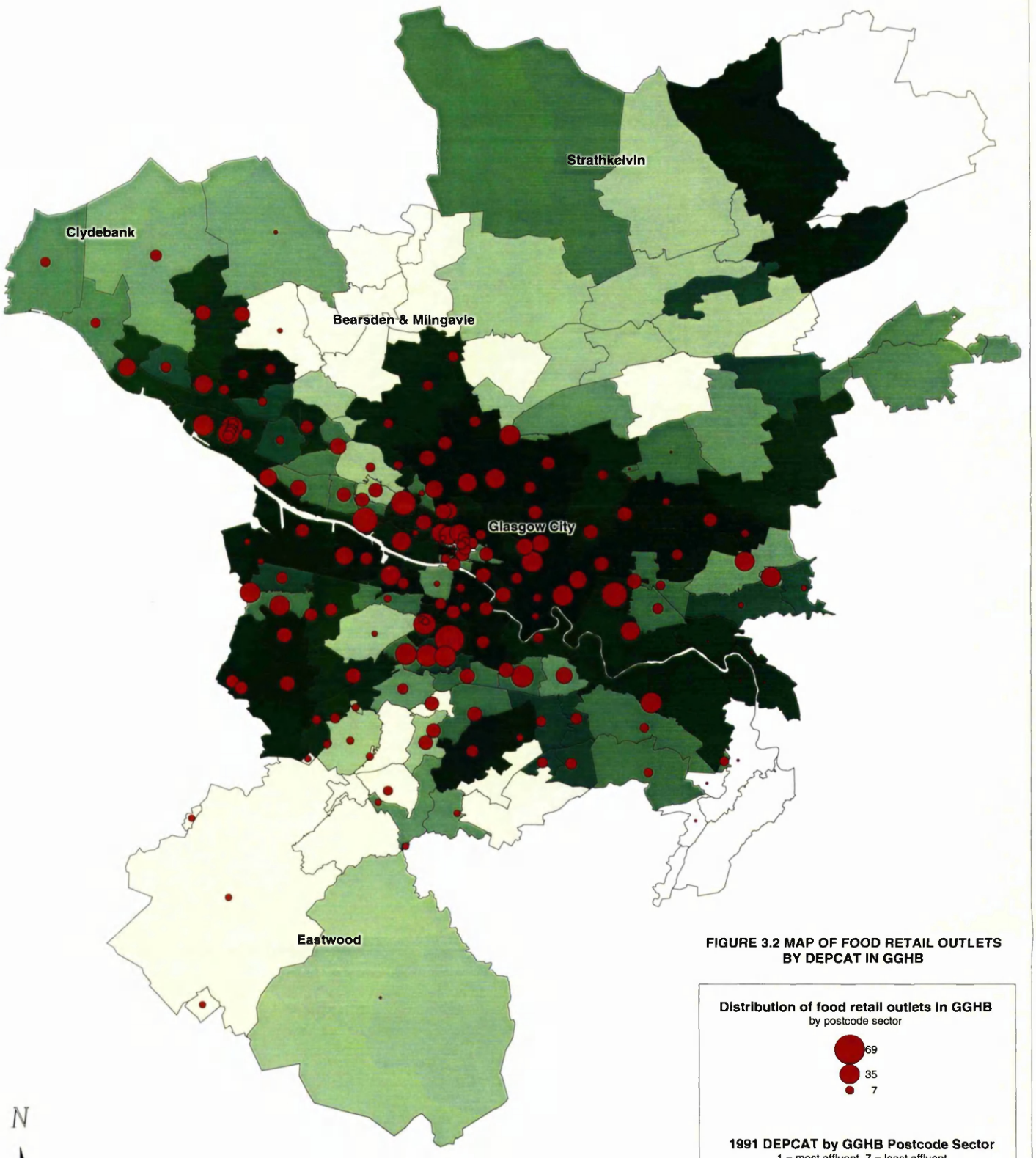


FIGURE 3.2 MAP OF FOOD RETAIL OUTLETS BY DEPCAT IN GGHB

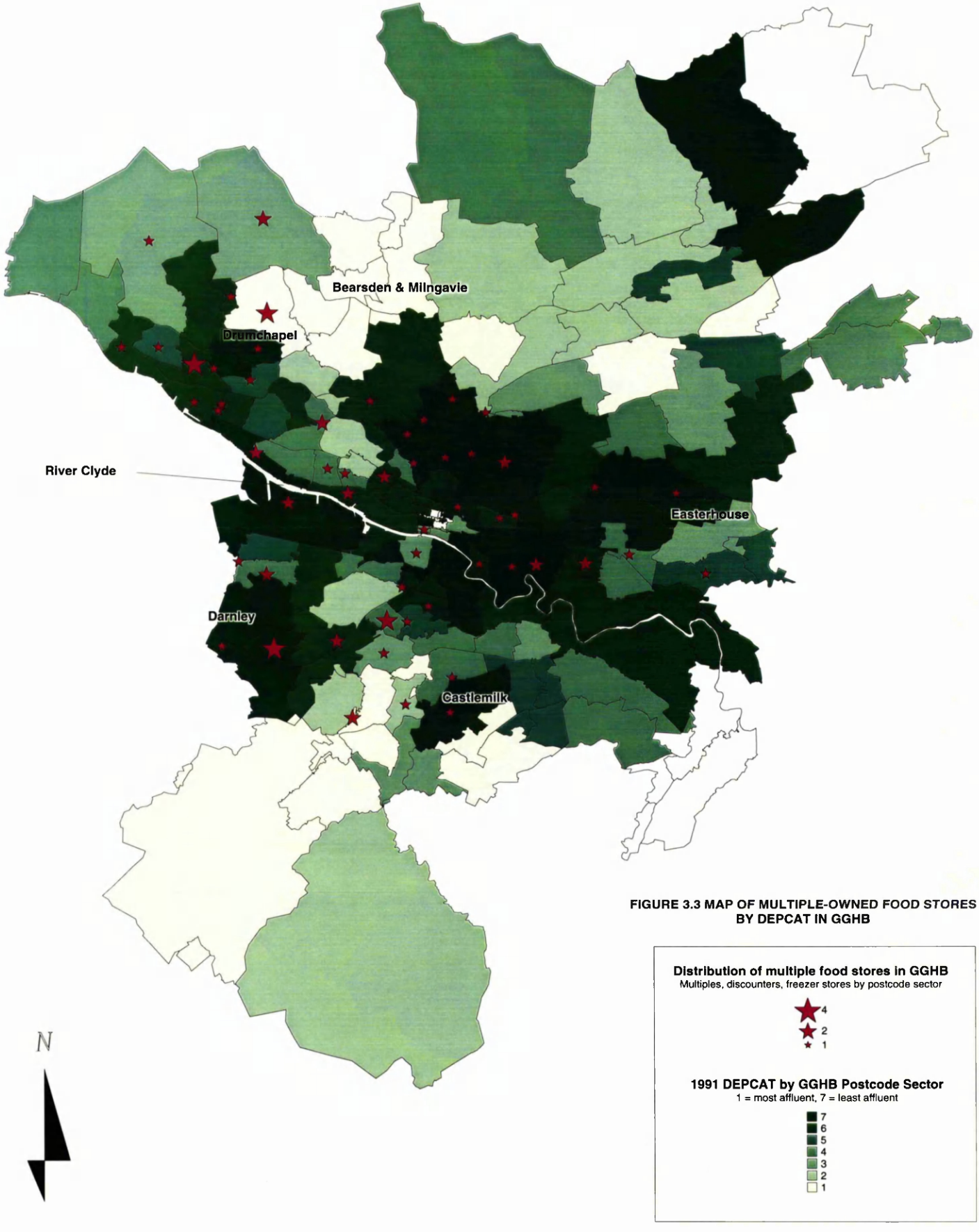


FIGURE 3.3 MAP OF MULTIPLE-OWNED FOOD STORES BY DEPCAT IN GGHB

The final map (figure 3.4) shows the distribution of multiple-owned food stores by population density in GGHB. The purple stars represent the number of multiple-owned food stores in each postcode sector. The location of multiple-owned stores tends to mirror that of all food retail outlets in GGHB. Throughout central GGHB, postcode sectors with higher population densities tend to have more multiple owned stores however the east / south-east areas are relatively underprovided in comparison to the west, in terms of population density. Again there are no multiple-owned outlets in the more sparsely populated areas in the north (Strathkelvin) and south (Eastwood). There is a statistically significant, though weak, positive relationship (Pearson's $r = .209$, p=. 010) between the number of people residing in postcode sectors and the number of multiple-owned stores (multiples, discounters, freezer stores) located there.

The previous sections have illustrated that food retailing in the UK has undergone considerable change over the last 20 years. During the 1980s a polarisation of shopping opportunities was precipitated by the advent of larger and larger food retail superstores on edge and out-of-town sites. Increasingly intense food price and food choice competition began to force the closure of shops in traditional town centre locations. Consequently the total number of independent 'traditional' stores (butchers, bakers, fishmongers) and corner shops began to shrink as these larger food retail business began to offer a 'one stop' shopping experience. This caused a reorientation of retail land-use, which favoured the affluent car-owner at the expense of certain 'disadvantaged' groups characterised by low mobility, such as the disabled, one-parent families and the elderly. As food shopping opportunities were unevenly stripped out of urban areas of the UK the ability of disadvantaged groups to take advantage of the cheaper food offered by the larger multiple owned companies to purchase a 'healthy diet' was compromised.

During the 1990s the British food retail economy experienced the entry of European limited-line discounters. These stores colonised locations previously thought of as unprofitable and undesirable and began to successfully compete with other multiple-owned stores on price. Town centres had by this point had become to resemble under-exploited markets and thus the big companies began to return through the development of smaller 'compact' neighbourhood stores. There is little published research as yet

which explores the impact this has had on consumer choice for the disadvantaged and their ability to access a decent range of food.

The maps presented in this section give a flavour of the organisation of retail space in the Greater Glasgow Health Board area during the fieldwork for this study was undertaken. We can see that food stores are relatively evenly spread over the city both by population density (figure 3.1), and by area deprivation (figure 3.2). Even when we consider the location of 'multiple-owned' stores only we can still see that poor areas, often described as being at a relative disadvantage compared to more affluent areas, do quite well in terms of multiple shopping opportunities (figure 3.3). When we consider the location of multiple stores by population density we again find a fairly even spread around GGHB (figure 3.4). However the east and south-east of the city are relatively underprovided for in relation to the west.

However it could also be argued, especially in light of recent increases in the amount of floorspace per retail outlet in Scotland (Dawson 2000), that a neighbourhood with higher numbers of shops may indicate that inward investment has bypassed these areas. Indeed higher numbers of shops may even be an indicator of deprivation rather than amenity – a measure of floorspace may be a more accurate way of measuring access to retail facilities in poor neighbourhoods. Similarly this would also be based upon the assumption that each square foot of retail space is the same as any other, an assumption which obviously does not take into consideration the quality and scale of the shopping environment. Perhaps, in future studies, an idea of the age of each retail operation would also give an indication of quality, something that this thesis does not cover.

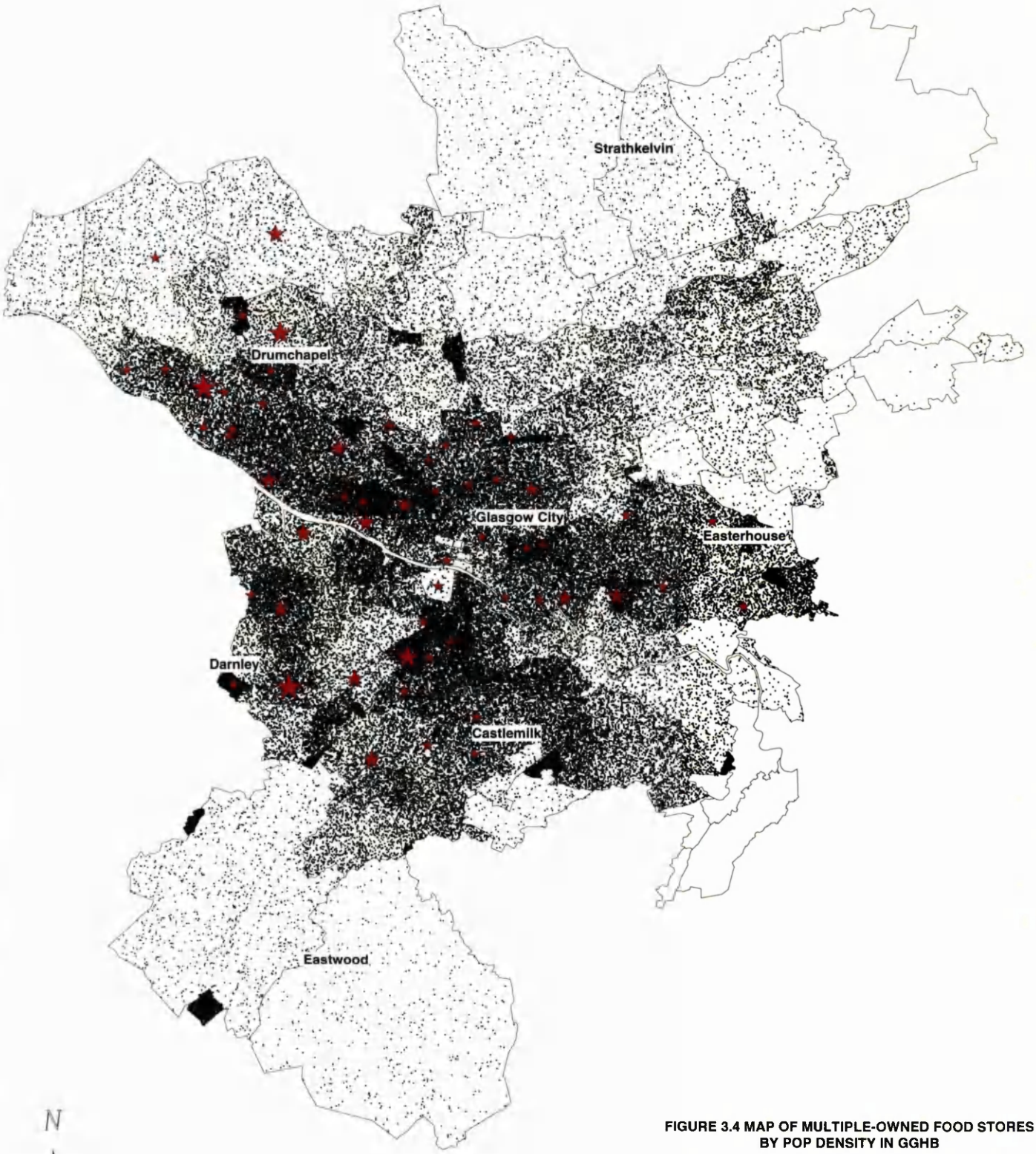


FIGURE 3.4 MAP OF MULTIPLE-OWNED FOOD STORES BY POP DENSITY IN GGHB

Population density of GGHB
by postcode sector, from 1991 British Census

1 Dot = 10 people

Distribution of multiple food stores in GGHB
Multiples, discounters, freezer stores by postcode sector

4
2
1

3.2 A Description of Food Retailing in the Study Sample

This section describes the structure of food retailing in the study sample and relates it to the wider UK literature on retail restructuring. In the following section we use Chi-Sq (χ^2) which is for nominal / ordinal (categorical) data. In our analysis of the data presented in tables 3.6 and 3.7 we can also generate Cramer's V to test for the strength of association. Cramer's V varies between -1 and +1. A relationship of -1 or +1 would indicate a perfect association, negative or positive respectively, between two variables. The complete absence of a relationship would be indicated by a score of 0.. The following convention for significance levels is used, ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.

Table 3.5 shows the distribution of shops by format in the sample. Within this survey Independent stores are the most common format of non-multiple, accounting for 48% of non-multiple sample while 'multiple-owned' superstores account for 50.6% of all 'multiples'. Traditional 'specialist' stores such as butchers, bakers and fishmongers do not constitute a high proportion of the non-multiple sample, which is not surprising considering the continuing decline in total numbers of these formats within the UK (Caines, 1997).

Precise comparison of figures at a UK and Scottish level are impossible due to the lack of detail afforded by the ONS Retail Inquiry (Smith & Sparks, 1997). The category 'changed function' refers to shops that are still open but whose function has changed from that which is recorded by the Public Register of Food Premises to a non-food retail function, or a format which is not applicable to this survey (usually an off-licence, chemist or forecourt garage).

Table 3.5 Distribution of shops by format in the sample

Shop Type	%	N
Multiple-owned superstore	50.6	40
Discounter	32.9	26
Freezer Store	16.5	13
Total Multiples	***100***	***79***
Affiliated Independents/ Symbol groups	3.7	9
Independent Grocers	48.0	118
Butchers	10.2	25
Fruit & Vegetable Shops	10.2	25
Bakers	6.1	15
Fishmongers	2.7	7
Delicatessen	2.4	6
Changed Function	16.7	41
Total non-multiples	***100***	***246***

Table 3.6 shows the distribution of shop formats in the survey sample by health board locality. There is no statistically significant relationship between shop type and locality ($p=0.811$) and there is a relatively weak association (Cramers $V = 0.211$). However the sparseness of numbers (cell counts of less than 5) in the table makes it difficult to reach any conclusions, and since the localities are nominal categorical rather than ordinal variables they cannot be appropriately combined to increase cell size. Generally independent stores are the most common format in each locality, with Parkhead/Easterhouse having the highest number of independent stores/small grocers, and Govan having the greatest percentage. Multiple-owned stores are present in every locality except for Rutherglen/Cambuslang & Eastwood, and are most common in

Clydebank. Those stores that have changed function are most common in Springburn/Possilpark (14.6%) and Shettleston/Bailleston (14.6%). This may reflect a more volatile retail market with a higher turnover of businesses in these areas, due to an increased likelihood of small business failure. Specialist stores such as butchers, bakers and fishmongers are particularly concentrated in Shettleston/Bailleston locality and are not represented in Maryhill/Woodside (though of course they may not have been picked up in the sample). The table also illustrates the range of outlets present in each locality. Maryhill/Woodside has the smallest range of shop formats on offer (3) and Springburn/Possilpark has the greatest (11). Springburn/Possilpark is also the only locality that exhibits the full range of formats according to the survey shop classification.

Table 3.7 shows how shop formats in the survey sample are distributed by level of locality deprivation as measured by Carstairs-Morris DEPCAT (see chapter 2). Most previous research highlights the lack of shops in the poorest places (SEU 1998, SOHHD, 1993). Here we find results contrary to expectation. Shop outlets in the survey sample are found to be concentrated in the more deprived localities (DEPCATs 5, 6 and 7). However this is not statistically significant (p=0.561) and has a relatively weak association (Cramers V = 0.172). Again this finding may be due to the sparseness of numbers in the table (cell counts of less than 5), which make it difficult to reach any statistical conclusions.

Table 3.6 Distribution of shops by health board locality in the sample

Locality	Multiple	Discounter	Freezer Store	Affiliated Indpndnt	Indpndnt Grocer	Butcher	Fruit & Veg	Baker	Fishmngr	Deli.	Changed Function	*Total*
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Bridgeton/ Townhead	1 (4)	3 (12)	1 (4)	1 (4)	13 (52)	2 (8)	4 (16)	-	-	-	-	*25 (100)*
Shettleston/ Bailleston	2 (5.4)	2 (5.4)	-	3 (8.1)	13 (35.1)	4 (10.8)	4 (10.8)	3 (8.1)	-	-	6 (16.2)	*37 (100)*
Parkhead/ Easterhouse	4 (13.8)	2 (6.9)	-	-	14 (48.3)	3 (10.3)	1 (3.4)	1 (3.4)	1 (3.4)	-	1 (3.4)	*29 (100)*
Maryhill/ Woodside	1 (8.3)	2 (16.7)	-	-	7 (58.3)	-	-	-	-	-	2 (16.7)	*12 (100)*
Springburn/ Possilpark	3 (10.7)	2 (7.1)	1 (3.6)	2 (7.1)	8 (28.6)	2 (7.1)	1 (3.6)	1 (3.6)	1 (3.6)	1 (3.6)	6 (21.4)	*28 (100)*
Govanhill/ Gorbals	2 (8.3)	1 (4.2)	-	-	10 (41.7)	1 (4.2)	1 (4.2)	2 (8.3)	1 (4.2)	1 (4.2)	5 (20.8)	*24 (100)*
Rutherglen/ Cambuslang	-	-	-	-	6 (42.9)	3 (21.4)	1 (7.1)	-	-	1 (7.1)	3 (21.4)	*14 (100)*
Eastwood	-	-	-	1 (20)	2 (40)	1 (20)	1 (20)	-	-	-	-	*5 (100)*
Castlemilk/ Cathcart	2 (20)	1 (10)	-	-	3 (30)	1 (10)	1 (10)	-	1 (10)	-	1 (10)	*10 (100)*

Shawlands/ Pollokshields	1 (10)	1 (10)	1 (10)	-	1 (10)	1 (10)	2 (20)	1 (10)	-	-	2 (20)	***10 (100)***
Govan	1 (8.3)	1 (8.3)	-	1 (8.3)	7 (58.3)	-	1 (8.3)	-	-	-	1 (8.3)	***12 (100)***
Pollok/ Cardonald	6 (18.8)	5 (15.6)	3 (9.4)	1 (3.1)	10 (31.3)	2 (6.3)	-	-	1 (3.1)	-	4 (12.5)	***32 (100)***
Bearsden/ Milngavie	2 (16.7)	1 (8.3)	2 (16.7)	-	3 (25)	1 (8.3)	-	2 (16.7)	-	1 (8.3)	-	***12 (100)***
Drumchapel	2 (28.6)	-	1 (14.3)	-	2 (28.6)	1 (14.3)	-	-	-	-	1 (14.3)	***7 (100)***
Clydebank	8 (28.6)	2 (7.1)	1 (3.6)	-	8 (28.6)	-	3 (10.7)	1 (3.6)	1 (3.6)	-	4 (14.3)	***28 (100)***
Knightswood/ Yoker	2 (15.4)	2 (15.4)	1 (7.7)	-	3 (23.1)	2 (15.4)	-	1 (7.7)	-	-	2 (15.4)	***13 (100)***
Partick/ Hyndland	3 (11.1)	1 (3.7)	2 (7.4)	-	8 (29.6)	1 (3.7)	3 (11.1)	3 (11.1)	1 (3.7)	2 (7.4)	3 (11.1)	***27 (100)***

Significance

P = 0.811, Cramer's V = 0.211

Table 3.7 Shop formats by locality DEPCAT

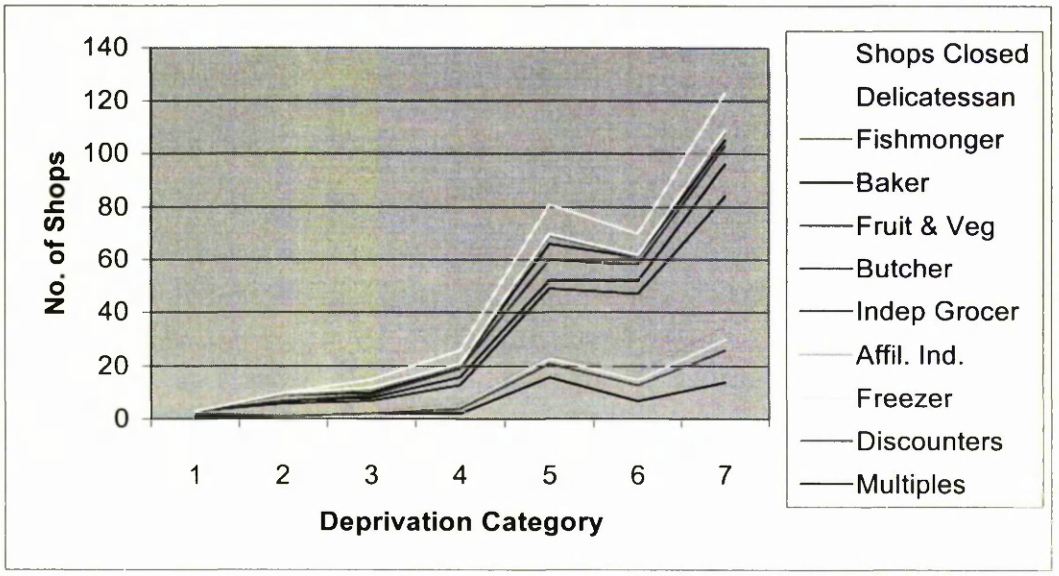
Shop	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)	6 N (%)	7 N (%)
Multiple	2 (16.7)	-	-	5 (13.2)	12 (13)	15 (37.5)	6 (8.5)
Discount	1 (8.3)	-	-	2 (5.3)	6 (6.5)	11 (10.2)	6 (8.5)
Freezer	2 (16.7)	-	-	3 (7.9)	2 (2.2)	3 (2.8)	3 (4.2)
Affiliated	-	-	-	-	3 (3.3)	2 (1.9)	4 (5.6)
Indpndnt	3 (25)	-	2 (50)	9 (23.7)	30 (32.6)	44 (13.5)	30 (42.3)
Butcher	1 (8.3)	-	1 (25)	2 (5.3)	9 (9.8)	7 (6.5)	5 (7)
Fruit & Veg	-	-	1 (25)	5 (13.2)	8 (8.7)	5 (4.6)	6 (8.5)
Baker	2 (16.7)	-	-	4 (10.5)	5 (5.4)	3 (2.8)	1 (1.4)
Fish	-	-	-	1 (2.6)	1 (1.1)	4 (3.7)	1 (1.4)
Deli	1 (8.3)	-	-	2 (5.3)	1 (1.1)	1 (0.9)	1 (1.4)
Changed Function	-	-	-	5 (13.2)	15 (16.3)	13 (12)	8 (11.3)
Total	***12*** ***(100)***	-	***4*** ***(100)***	***38*** ***(100)***	***92*** ***(100)***	***108*** ***(100)***	***71*** ***(100)***

Significance

P = 0.561, Cramer's V = 0.172

Figure 3.5 shows total number of shop formats by postcode district level of deprivation as measured by DEPCAT in the survey sample. Similar to table 3.7 it can be seen that within our survey sample shops are concentrated in the most deprived areas, in this case postcode districts.

Figure 3.5 Distribution of shops in the sample by postcode district DEPCAT



Due to the nature of the data garnered from the Public Register of Food Premises it is difficult to ascertain whether the structure of the survey sample is an accurate reflection of the wider food retail landscape in the Greater Glasgow Health Board area. However the size, geographical spread and completeness of the survey sample represents an attempt to be the largest and most systematic of its type. There is no indication that the survey sample is anything other than a fair and accurate representation of GGHB's food retailing system.

In summary, Independent store/small grocers are the most common shop type. The range of outlets in each locality is not equal. Springburn/Possilpark contains the greatest number of shop formats and Maryhill/Woodside the least. However the poorest localities and postcode districts contain the greatest number of shops, and each shop 'type' has greater numbers in the poorer locations. In the poorest areas of the study site the majority of shops tend to be small, independent grocers. The multiple-owned retail

outlets, often criticised as being inaccessible to the urban poor, are found in greater numbers in the poorest places. In terms of the number of shops per 1000 population we again find that the most deprived health board localities have the greatest number of shops available to their resident population.

Most of these findings about the location of food shops in GGHB are based upon relationships that are statistically significant though relatively weak. This may be due in part to small sample size (e.g. for localities), outliers in the data, and possible problems with Strathkelvin data. The key point however is that there is no clear evidence that food shops in general, and multiples in particular, are more likely to be located in more affluent areas, or that more deprived areas could be characterised as 'food deserts'.

Though these descriptive results do not confirm all that is suggested by the retailing literature, it does highlight that the structure of food retailing is, to some extent, spatially polarised both by geographical location and level of deprivation, though not necessarily in the way one might expect.

Chapter 4: Shop type differences in food price and availability

In the preceding chapters it has been suggested that the type of food retail outlet in which you shop determines the price of food and its availability (Raven et al 1995, Piachaud & Webb 1996). This chapter briefly reviews this literature on the price and availability of food and how it varies by retail format, and then goes on to describe the price and availability of food by type of shop within the survey sample.

There is a scant literature on the price and availability of food and how it differs by type of shop. Sparks (1996a) notes that since the demise of the decennial Census of Distribution (the last being in 1971) there is now no comprehensive national data-set which quantifies what food is sold where (though not in great detail), and in what sorts of shops. The lack of an official empirical base with a spatial element severely hampers any attempt to provide local authorities with the evidence needed to inform local retail planning. Local authorities often have to rely on one-off ad-hoc surveys which do not give a true insight into local and wider retail change. Consequently there is very little empirical academic literature on the nature and extent of spatial aspects of food distribution and shop type in the UK. What information there is usually refers to the large national and international multiple-owned food companies - see for example Wrigley (1996, 1998a, 1998b), Guy (1994), Shaw et al (1989) - and is sometimes based on data provided by their own highly specialised and well funded site research units (Penny & Broom, 1988). These data are consequently not very accessible to independent researchers because of their commercial value.

Varied classifications of store types can be found in academic literature, consultancy reports and official statistics; however, size thresholds drive most of these classifications. Despite size alone being a fairly simplistic basis for the categorisation of food retail forms, store size does have an influence on store format and layout. For example; the size of a store partially determines the extent and range of products that can be carried. Smaller sized stores cannot offer the same range of products as larger stores due to space constraints and must distinguish themselves by appealing to consumers in other ways such as convenience, price, quality and service (Burt & Sparks, 1995).

Burt & Sparks (1995) identify three contemporary types of food store based on size – small, medium and large. At the smaller end of the size spectrum a number of formats have emerged with stores typically averaging 350-600m^2 in size. These stores can be categorised into four types; Limited Line Discount Stores; Convenience Stores; Quality Specialists and Neighbourhood stores. As store sizes have polarised into the smaller and larger ends of the market, the medium sized stores (on average 1000-1500 m^2 in size) have tended to evolve into hybrid forms of some of these other formats. Many remained as conventional supermarkets though some have evolved into discount stores, or supermarkets with an extended product range, as a consequence of their physical size compared to the smaller limited-line discounters. Larger grocery store formats have grown in number in most markets as retailers have sought to exploit economies of organisational scale. This sectoral shift has received the most academic attention in recent years (see chapter 3). These large multiple – owned grocery stores stock a wide range of food and non-food products and generally carry a product range with considerable depth and breadth. As a consequence of the attention by researchers on large food supermarket companies there is virtually no literature on the classification, nature and typology of small food stores (Smith & Sparks, 1997).

There are a handful of UK academic studies that seek explicitly to document the price and availability of food by 'type' of shop. Most of these are 'basket' studies undertaken locally (London Food Commission 1985, Welsh Consumer Council 1990, Piachaud & Webb 1996, Barratt 1997). One of the first studies was undertaken by the London Food Commission (LFC) in 1985. A price and availability survey of 84 food items in 17 'multiple' stores, split into a five-fold classification based on size (floor-space in m^2), was conducted in London. The study sought to assess whether differences existed in the price and range of food items between and within the three major food retail operators of that time: Tesco Ltd (and its now defunct discount format, Victor Value), J Sainsburys' plc & The Co-Op. Prices did vary between and within the stores studied (i.e. prices varied between different sized supermarkets owned by the same company, and between the same-sized supermarkets owned by different multiple groups). Only 31 out of the 84 food items in the survey were available at both small and large supermarkets. It was found that Tesco and the Co-Op operated a differential pricing structure in different sized stores, while J Sainsburys' plc had uniform pricing across

stores. Tesco had a two-tier system in place with food costing up to 7% more in small supermarkets, and Co-Op had a four-tier pricing structure with food costing up to 9% more in their smallest stores. The range of food on offer differed by store size, with, as expected, the smaller stores having the least choice. The Tesco-owned Victor Value discount format stocked no fresh vegetables and had a poor range of fish and cheese products, with the bulk of the foods on offer being processed and not 'nutritionally valuable' (LFC, 1985 p.77).

Similar results were also reported by the Welsh Consumer Council (WCC) in 1990. Again store size was related to the cost of food, with 'large shops' (multiple / co-operative owned superstores and supermarkets) having significantly cheaper food on offer when compared to 'small shops' (Independents and affiliates such as Spar). Small shops were, on average, 11.2% more expensive. It was noted however 'that considerable price variation existed within each category of shop with some affiliates cheaper than some multiples/co-ops and some independents cheaper than affiliates' (WCC, 1990, p11). The mean basket-of-food price was not statistically significantly different between superstores and supermarkets (though small differences did exist) but affiliates were significantly cheaper than independent stores. Food items were most available in the larger multiple and Co-Op stores in each of the survey areas, followed in order by affiliates, independents and specialist shops. Only three out of the 111 shops surveyed sold all 57 items on the day of the survey. The availability of 30 'healthy' food items was also noted; again, multiples and Co-Ops stocked the greatest range of healthy food and the independents sold the least.

Piachaud & Webb's (1996) study in selected areas of the UK on food price and availability is one of the few that explicitly included shop type. It was conducted in two stages. Firstly the authors conducted an in-depth survey in Northampton and selected a loosely defined collection of shops which included; a village shop, two corner shops, a convenience store, small independent supermarket, two discounters and a large edge-of-town superstore. Secondly, a price comparison between pairs of small shops and supermarkets was undertaken in five areas around Britain. The in-depth survey revealed that, as one might expect, the smaller stores (village, corner and convenience stores) were the most expensive. Of the larger stores the discounter (Netto) was by far the

cheapest. A two tier pricing system was found to be in operation with directly comparable foods in small stores being 20% more expensive than those found in large stores. The cheapest available versions were also compared and were found to be 60% more expensive in the small shops than in larger stores.

It is also wise to mention here, that the most recent published report of food price was that undertaken by the Competition Commission (2000). Their specially commissioned research for multiple-owned stores in the UK found that most consumers (71%) shopped weekly at a supermarket irrespective of they amount of money that was spent on each shop with the largest group (31%) spending between £51-75 per week. Only 1% of respondents used local small shops exclusively for their food shopping. However this extensive report did not consider food price variations between independent and multiple stores, focusing exclusively on the price competitive practices of multiple-owned stores.

These few UK studies report very similar results. Based on the work outlined above we would expect to find that 'large' stores (multiples) are cheaper than 'small' stores (independents) and have the greatest range of food on offer. This study categorises shops on more than just size, accepting that each type of shop in the study is different, with a different role, function and market. This chapter aims to highlight which of these shops are the cheapest and the most expensive; and which of these shops have the best and worst availability of food. This chapter will now compare the price and availability of food between a range of shop types. Results are given first for food price, and then food availability.

4.1 Results from the survey: food price

We investigated whether or not a relationship existed between food price and shop type for each of the 57 food items in the survey. The food price data were analysed in three different ways. Firstly all cases in the sample were analysed, and then sub-samples consisting of 'multiple stores' and 'independent' stores were analysed separately[1]. In each set of bivariate analyses three food price variables were tested against shop type.

[1] Sub-sample 'multiples' = multiples + discounters + freezer centres. Sub-sample 'independents' = affiliates + independents + fruit & vegetable stores + butchers + fishmongers + bakers + deli's.

These variables were; mean lowest price; mean brand price; and mean price-range (a variable produced by calculating the difference between the most expensive item and the cheapest item in each case). Details of the statistical methods used in this section (ANOVAs) can be found in Chapter 2.6. The results are presented below.

Food price in all stores

Appendix B table A shows the mean lowest price of all the food items in the study by type of shop. All the 57 food items in the shopping basket (with the exception of teacakes and cod fillets) showed a statistically significant relationship with shop type. There is no clear pattern of food price by shop type, though the 'discounters' are in general (but not always) the cheapest outlets. Lower prices for some goods were found in 'multiple' stores (e.g. cornflakes, wheat cereal biscuits and tea bags). The shops which are the most expensive vary with the type of goods on offer. Delicatessens are the most expensive for some everyday items such as breads and cereals. Independent (as opposed to multiple) stores are more expensive for all goods. The 'mean lowest price' for each food item by shop type was calculated (see appendix B). The shop type(s) that had the lowest and highest price for each food item was noted and the results are shown in Table 4.1. The cheapest type of shop was 'discounters' with double the number of cheapest lowest priced food items sold than the next shop type - multiples. The most expensive lowest priced food items were more evenly spread within shop types. Delicatessens and independent grocers were the most expensive for 17 and 15 'mean lowest price' items respectively.

In appendix B table B the mean price of food items for which a brand could be assigned were compared across shop type. Four items were found to show no significant differences in mean brand price. These items were; Hall's sausages, Bird's Eye Beefburgers, Hartley's Strawberry Jam and Cadbury's chocolate bar (small).

Table 4.1 Cheapest and most expensive shops for 'lowest priced' food items (all shops)

Rank	Cheapest (no of food items)	Rank	Most Expensive (no of food items)
1	Discounters (36)	1	Delicatessen (17)
2	Multiples (16)	2	Independent Grocers (15)
3	Affiliated Independents (3)	3	Fruit & Veg (8)
4	Fruit & Veg (2)	4	Multiple (6)
5=	Independent (1)	5	Affiliated Independent (5)
5=	Delicatessen (1)	6=	Butcher (3)
		6=	Freezer Store (3)

*In some cases more than one shop type was the cheapest or the most expensive for a given food item. This accounts for numbers greater than the 57 food items surveyed in the study

Again, 'discounters' are the cheapest category of shop with 26 branded items being cheapest in these stores. However some branded items did not appear in discount stores (Allinson's Wholemeal Loaf, Hall's Sausages, Birds Eye Fish Fingers, McCains Oven Chips, Hartley's Strawberry Jam and Coca-Cola) making the multiple stores the cheapest for those items. Again, categorising the most expensive type of shop for branded food items is problematic with no clear pattern emerging though independent grocers (18 items), affiliated independents (10 items) and delicatessens (10 items) were the most expensive for some food items (see table 4.2).

Table 4.2 Cheapest and most expensive shops for branded food items (all shops)

Rank	Cheapest (no of food items)	Rank	Most Expensive (no of food items)
1	Discounters (26)	1	Independent Grocer (18)
2	Multiples (13)	2=	Affiliated Independent (10)
3	Affiliated Independent Grocer (5)	2=	Delicatessen (10)
4	Freezer Store (4)	3	Fruit & Veg (8)
5=	Independent (1)	4=	Multiple (1)
5=	Delicatessen (1)	4=	Freezer Store (1)
		4=	Butcher (1)

*In some cases more than one shop type was the cheapest or the most expensive for a given food item. This accounts for numbers greater than the 57 food items surveyed in the study

The mean price range of each food item is shown in appendix B table C. Again, nearly all food items showed a significant difference in price range across shop type. Only three items were recorded as having no significant differences in price range between shop types; white baps, cod fillets and chocolate. Table 4.3 shows that multiple stores have 33 food items with the greatest price range. Independent grocers (31), freezer stores (29), affiliated independents (26) and delicatessens (26) have food items with the smallest price range. These figures look unusual due to the large number of food items that recorded identical price ranges across shop types. This may be due to a limited range of stock being carried by smaller stores and conversely multiple stores carrying a variety of in house retailer brands such as a value line (Tesco Value, Sainsburys' Essentials, Safeways Savers), a standard line (Safeway, Tesco, Sainsburys') and a premium line (Tesco Finest, Sainsbury Taste The Difference, Safeway's The Best.

Table 4.3 Smallest and greatest price ranges by shop type for lowest price food items (all shops)

Rank	Smallest price range (no of food items)	Rank	Greatest price range (no of food items)
1	Independent Grocer (31)	1	Multiple (33)
2	Freezer Store (29)	2	Discounter (7)
3=	Affiliated Independent (26)	3	Delicatessen (6)
3=	Delicatessen (26)	4	Fruit & Veg (3)
4	Fruit & Veg (25)	5	Butcher (2)
5	Discounter (20)	6=	Baker (1)
6	Multiple (13)	6=	Fishmonger (1)
7	Butcher (12)		
8	Baker (3)		

*In some cases more than one shop type was the cheapest or the most expensive for a given food item. This accounts for numbers greater than the 57 food items surveyed in the study

Food price in multiple stores

Most previous food price and availability studies tend to categorise 'multiple' stores as a homogenous group with similar characteristics. This next set of tables shows which types of 'multiple' food outlet are the cheapest or most expensive and seeks to investigate whether there are variations between types of multiple store in the price of food. Appendix B table D shows that, similar to 'all shops', nearly all food items show significant differences in mean lowest price by type of multiple store. Nine items show no significant differences. Table 4.4 demonstrates that discounters are by far the cheapest, retailing 41of the cheapest mean lowest price food items in this sub-sample.

Freezer stores have the greatest number of most expensive mean lowest price foods (37).

Table 4.4 Cheapest and most expensive shops for lowest priced food items (multiples only)

Rank	Cheapest (no of food items)	Rank	Most Expensive (no of food items)
1	Discounter (41)	1	Freezer Store (37)
2	Multiple* (13)	2	Multiple* (12)
3	Freezer Store (1)	3	Discounter (4)

**In this table multiple refers to the mainstream food superstores such as Safeway, J Sainsbury, Tesco, Asda*

Appendix B table E show the cost of branded food items in multiple stores. Eight branded food items did not differ significantly in price by type of multiple store. Where direct comparisons were possible branded foods were always cheaper, or the same price, in discounter stores compared to both multiple and freezer outlets. For branded food items discounters were found to be consistently the cheapest format with 31 items, and multiples the most expensive with 24 items (table 4.5).

Table 4.5 Cheapest and most expensive shops for branded food items (multiples only)

Rank	Cheapest (no of food items)	Rank	Most Expensive (no of food items)
1	Discounter (31)	1	Multiple* (24)
2	Multiple* (7)	2	Freezer Store (16)
3	Freezer Store (1)	3	Discounter (1)

**In this table multiple refers to the mainstream food superstores such as Safeway, J Sainsbury, Tesco, Asda*

Price ranges for lowest priced food items in multiple stores can be seen in appendix B table F. All foods showed statistically significant differences in mean price range by multiple shop format with the exception of jam tarts, burgers, old potatoes, frozen chips, lettuce, cucumber, onions and sultanas. The smallest ranges in mean lowest price range in multiple shops were found in freezer stores (29 food items), the greatest in multiple stores (34 items) (see table 4.6). Eight food items were found to have a zero price range.

Table 4.6 Smallest and greatest price ranges by shop type for lowest price food items (multiples only)

Rank	Smallest Price Range (no of food items)	Rank	Greatest Price Range (no of food items)
1	Freezer Store (29)	1	Multiple* (34)
2	Discounter (21)	2	Discounter (8)
3	Multiple* (3)	3	Freezer Store (2)

**In this table multiple refers to the mainstream food superstores such as Safeway, J Sainsbury, Tesco, Asda*
***A zero price range was recorded for 8 food items*

Food price in independent stores

A consideration of different shop formats within the 'independent' sector was also undertaken. Appendix B table G shows that within the sub-sample 'independent' stores, 23 food items displayed non-significant results when mean lowest food price was tested against independent shop type. Affiliated independent stores stock the greatest number of cheapest 'mean lowest priced' food items (29). Delicatessens and Independent grocers stock the greatest number of the most expensive 'mean lowest price' food items (17 apiece) (table 4.7). However it should be noted that direct comparisons were difficult in the independent stores sub-sample as you would not expect some stores to stock certain foods. For example, bakers would not be expected to stock meat and butchers would not be expected to stock bread products. The issue of availability by shop type will be dealt with later in the chapter.

Table 4.7 Cheapest and most expensive shops for lowest priced food items (independent stores only)

Rank	Cheapest (no of food items)	Rank	Most Expensive (no of food items)
1	Affiliated Independent (29)	1=	Independent Grocer (17)
2	Fruit & Veg (11)	1=	Delicatessen (17)
3	Independent Grocer (10)	2	Fruit & Veg (10)
4	Delicatessen (9)	3	Affiliated Independent (8)
5	Baker (4)	4	Butcher (6)

**In some cases more than one shop type was the cheapest or the most expensive for a given food item. This accounts for numbers greater than the 57 food items surveyed in the study*

Appendix B table H shows 17 non-significant results for branded foods by independent store shop type. Foods that do show significant results do not demonstrate a clear pattern. Table 4.8 shows the cheapest and most expensive shops for branded food items in the independent stores sub-sample. Again affiliated independents offer the greatest number of cheapest branded food items and independent grocers the greatest number of most expensive branded food items, bearing in mind the same comparability issues discussed in relation to the previous table.

Appendix B table I shows price range by shop type in the independent stores sub-sample. Twenty-two food items display non-significant results, many of which are a function of a zero price range. Many shop formats in the independent stores sub-sample have similar numbers of food items with the smallest and greatest ranges. However specialist stores such as fishmongers, bakers and butchers, as you might expect, have fewer of food items in both greatest and smallest categories due to them carrying limited lines of food items when compared to the 'general' grocers. Sixteen food items had a zero price range.

Table 4.8 Cheapest and most expensive shops for branded food items (independent stores only)

Rank	Cheapest (no of food items)	Rank	Most Expensive (no of food items)
1	Affiliated Independent (19)	1	Independent Grocer (15)
2	Fruit & Veg (13)	2=	Affiliated Independent (11)
3=	Independent Grocer (6)	2=	Delicatessen (11)
3=	Delicatessen (6)	3	Fruit & Veg (6)
4=	Butcher (1)	4	Butcher (1)
4=	Baker (1)		

Table 4.9 Smallest and greatest price ranges by shop type for lowest price food items (independents only)

Rank	Smallest Price Range (no of food items)	Rank	Greatest Price Range (no of food items)
1	Independent Grocers (17)	1	Affiliated Independents (14)
2=	Affiliated Independents (16)	2=	Independent Grocers (10)
2=	Fruit & Veg (16)	2=	Delicatessen (10)
3	Delicatessen (15)	3	Butcher (5)
4	Butcher (7)	4	Baker (3)
5	Baker (2)	5	Fruit & Veg (2)
		6	Fishmonger (1)

A zero price range was recorded for 16 food items

Small stores or big stores?

In addition to considering differences in food price *within* different types of multiple stores and independent stores we can also compare differences *between* these two groups. As mentioned earlier in the chapter some previous studies have categorised food price as a function of store size. We can conduct a similar analysis by comparing multiple stores and independent stores. Though floorspace figures were not available for shops in the survey sample we can assume that on average stores are larger in the 'multiples' group than in the 'independents'. This comparison can also illustrate any differences in price between multinational food retailers and sole-owned or franchised independents.

Table 4.10 shows differences in mean lowest price between multiple and independent stores. The shaded items represent foods that are more expensive in independent shops. Fifty-one of the fifty-seven foods in the survey sample are more expensive, on average, in independent stores than in multiples. Thirty-five of these fifty-one differences reach statistical significance. There is no discernible pattern to those foods which are significantly cheaper in independent stores (topside beef, chicken, cod, old potatoes and chocolate). It is worth noting that some seemingly large price differences (for example cornflakes and old potatoes) between the two groups with similar Ns are not statistically significant. This may be due to a group of outliers in a certain type of shop within the data set. These items, and others, may not display significant results due to the range of food items on sale in each retail category. Stores in the multiple group have a greater product mix which includes own brand 'no frills' products at a substantially lower price which affect the results. Independent stores are not able to offer this type of product and subsequently mean lowest price is higher. However we did not exclude these data from the analysis as the reality of everyday shopping for those groups who use independent stores is that their ability to be price efficient is constrained by the prices these sorts of shops offer.

Table 4.10 Differences in mean lowest price between multiple and independent stores

Food Items	Multiples £ (n)	Independents £ (n)	Significance (t-test)
White Sliced (lge)	.25 (72)	.54 (108)	***
White unsliced (sml)	.45 (25)	.46 (23)	ns
White Baps	.13 (33)	.13 (64)	***
W'meal Sliced (lge)	.40 (72)	.71 (90)	**
W'meal Sliced (sml)	.43 (71)	.52 (58)	*
Cornflakes	.61 (72)	1.19 (67)	ns
Wheat Cereal	.93 (71)	1.27 (54)	ns
Biscuits			
Spaghetti (dried)	.24 (64)	.63 (54)	**
Spaghetti (tinned)	.14 (67)	.36 (73)	***
Jam Tarts	.39 (23)	.70 (12)	ns
Digestive Bisc'ts	.48 (72)	.77 (81)	**
(plain)			
Digestive Bisc'ts	.73 (70)	1.07 (79)	ns
(choc)			
Teacakes	.67 (7)	.72 (15)	ns
Beef (topside)	5.04 (43)	4.23 (22)	***
Beef (mince)	2.02 (64)	2.27 (25)	*
Bacon (str'ky)	1.21 (65)	1.73 (58)	ns
Chicken	5.57 (56)	4.66 (11)	ns
Sausages	.56 (72)	1.09 (70)	ns
Burgers	.57 (74)	1.31 (45)	***
Cod Fillets	6.91 (17)	5.57 (8)	**
Tuna (tinned)	.38 (74)	.73 (78)	***
Fish Fingers	.45 (66)	1.27 (29)	***
Butter	.51 (72)	.87 (68)	***
Margarine	.57 (72)	.73 (64)	*
Vegetable Oil	.59 (71)	.90 (47)	***
Milk (full)	.48 (75)	.62 (106)	*
Milk (semi)	.48 (75)	.62 (106)	*
Yoghurt	.14 (64)	.29 (45)	ns
Cheese (Cheddar)	3.11 (72)	5.32 (67)	ns

Eggs	.57 (75)	.65 (64)	***
Potatoes (new)	.18 (63)	.29 (34)	ns
Potatoes (old)	.20 (45)	.16 (53)	ns
Chips (frozen)	.69 (74)	1.35 (14)	ns
Cabbage	.21 (61)	.36 (24)	***
Lettuce (iceberg)	.54 (64)	.62 (36)	***
Carrots	.20 (64)	.23 (42)	ns
Cucumber	.45 (64)	.55 (38)	***
Tomatoes (fresh)	.53 (64)	.67 (53)	***
Onions	.20 (64)	.26 (47)	*
Baked Beans	.16 (74)	.34 (83)	***
Tomatoes (tinned)	.12 (71)	.32 (40)	*
Peas (frozen)	.46 (70)	1.58 (9)	**
Oranges	.20 (57)	.21 (52)	***
Apples	.41 (64)	.60 (59)	***
Bananas	.45 (64)	.52 (51)	***
Sultanas	.80 (38)	.90 (17)	**
Orange Juice	.45 (75)	.78 (66)	ns
Pears	.41 (63)	.47 (29)	*
Sugar	.66 (74)	.81 (78)	***
Jam	.55 (61)	.86 (52)	ns
Flour	.24 (66)	.84 (39)	ns
Tea Bags	.72 (74)	1.29 (70)	***
Instant Coffee	.81 (74)	1.69 (82)	***
Drinking Choc	.75 (63)	1.03 (14)	***
Soup (tomato)	.29 (70)	.49 (92)	*
Cola	.52 (74)	1.21 (86)	***
Chocolate	.33 (4)	.27 (97)	***

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Shading indicates those food items that are more expensive in 'independent' shops

We can control for price differences due to variations in food quality by comparing the cost of manufacturer branded food items in the large (all multiples) and small (all independents) stores (table 4.11). We reasonably assume that manufacturer branded items are consistent in quality and pack size. Again most branded food items recorded a significant difference in price between the two groups with only 8 items displaying no significant differences. Of those items displaying no significant differences, some fairly large price variations still existed. Again there appeared to be no discernible pattern of non-significance. With the exception of Bird's Eye Beefburgers, Heinz Baked Beans, Class 1 Potatoes, Sultanas, and Cadbury's Chocolate, the mean cost of branded food items was higher in independent stores. There were two items (Sunblest teacakes and Ski Yoghurt) that were not represented. This is due to the fact that the items like teacakes and yoghurts were not always available at the time data were collected – any items that were available were usually own brand goods or labels specific to the retailer. Thus generic items such as Ski and Sunblest were not represented in our sample though the types of food were.

Table 4.11 Differences in brand price between multiple and independent stores

Food Items	Multiples £ (n)	Independents £ (n)	Significance (t-test)
Kingsmill White Sliced (lge)	.52 (51)	.66 (58)	***
Allinsons Wh'meal Sliced (lge)	.55 (33)	.75 (44)	ns
Hovis Wh'meal Sliced (sml)	.46 (32)	.50 (33)	***
Kellogs Cornflakes	1.06 (56)	1.26 (60)	**
Weetabix	1.07 (56)	1.27 (52)	***
Marshalls Spaghetti (dried)	.59 (24)	.67 (7)	***
Heinz Spaghetti (tinned)	.31 (56)	.36 (73)	***
Jam Tarts	.88 (2)	.65 (1)	-
McVities Digestive Biscuits (plain)	.67 (56)	.79 (78)	***

McVities Digestive Biscuits (choc)	.98 (62)	1.11 (79)	***
Sunblest Teacakes	n/a	n/a	n/a
Hall's Sausages	.89 (1)	1.00 (31)	-
Birds Eye Beefburgers	.99 (64)	.99 (30)	ns
Princes' Tinned Tuna	.59 (64)	.76 (68)	*
Bird's Eye Fish Fingers	.97 (27)	1.33 (28)	ns
Anchor Butter	.68 (64)	.92 (43)	***
Flora Margarine	.94 (64)	1.02 (55)	***
Vegetable Oil	.60 (66)	.86 (24)	***
Wiseman Milk (full)	.51 (35)	.62 (102)	*
Wiseman Milk (semi)	.52 (60)	.62 (102)	**
Yoghurt	n/a	n/a	n/a
Edam Cheese (cheddar)	3.63 (67)	4.40 (18)	***
Class 1 Eggs	.58 (71)	.64 (63)	***
Class 1 Potatoes (new)	.18 (63)	.29 (33)	ns
Class 1 Potatoes (old)	.20 (40)	.16 (53)	ns
McCain's Straight Chips (frozen)	.97 (40)	1.35 (14)	ns
Class 1 Cabbage	.21 (61)	.35 (23)	***
Iceberg Lettuce	.54 (64)	.69 (33)	*
Class 1 Carrots	.20 (64)	.23 (42)	*
Class 1 Cucumber	.45 (64)	.55 (38)	***
Class 1 Tomatoes	.53 (64)	.68 (52)	***
Class 1 Onions	.20 (64)	.26 (46)	*
Heinz Baked Beans	.32 (64)	.36 (82)	***
Napolina Tomatoes (tinned)	.32 (37)	.42 (9)	*

Bird's Eye Peas (frozen)	.95 (64)	1.58 (9)	ns
Class 1 Oranges	.19 (57)	.21 (52)	***
Class 1 Apples	.52 (64)	.63 (49)	***
Class 1 Bananas	.45 (64)	.51 (48)	***
Sultanas	.89 (2)	.85 (6)	-
Del Monte Orange Juice	.87 (63)	.91 (17)	***
Class 1 Pears	.44 (63)	.47 (28)	ns
Tate & Lyle Sugar	.66 (73)	.81 (77)	***
Hartley's Strawberry Jam	.87 (1)	.88 (40)	-
Homepride Flour	.72 (38)	.78 (30)	***
PG Tips Tea Bags	1.58 (54)	1.78 (19)	***
Nescafe Instant Coffee	1.81 (64)	2.12 (78)	**
Cadburys Drinking Chocolate	.83 (42)	1.03 (13)	***
Heinz Soup (tomato)	.46 (62)	.47 (88)	***
Coca-Cola	1.20 (46)	1.28 (85)	***
Cadbury's Chocolate (sml)	.27 (1)	.27 (94)	-

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Shading indicates those food items which are more expensive in 'independent' shops

In the next table fifty of fifty-seven branded food items are shown as having a significant difference in price range between multiple and independent stores. Those items with no significant differences in price range (white baps, dried spaghetti, beef mince, streaky bacon, butter, apples and instant coffee) displayed no obvious pattern. For 44 of the 57 food items the price range was smaller in independent stores (see shaded areas in table 4.12). Again there appeared to be no obvious pattern for those items which had greater price ranges in independent stores.

Table 4.12 Differences in price range between multiple and independent shops

Food Items	Multiples (price range) £ (n)	Independents (price range) £ (n)	Significance (t-test)
White Sliced (lge)	.33 (72)	.11 (108)	***
White Unsliced (sml)	.02 (25)	.09 (23)	***
White Baps	.00 (33)	.00 (64)	ns
Wh'meal Sliced (lge)	.21 (71)	.25 (57)	***
Wh'meal Sliced (sml)	.08 (71)	.02 (58)	**
Cornflakes	.39 (72)	.07 (67)	***
Wheat Cereal Biscuits	.11 (71)	.01 (54)	***
Spaghetti (dried)	.36 (64)	.06 (54)	ns
Spaghetti (tinned)	.14 (67)	.00 (73)	***
Jam Tarts	.12 (23)	.00 (12)	***
Digestive Bisc'ts (plain)	.16 (72)	.02 (81)	***
Digestive Bisc'ts (choc)	.23 (70)	.04 (79)	***
Teacakes	.03 (70)	.00 (15)	***
Beef (topside)	.00 (43)	1.04 (22)	***
Beef (mince)	1.73 (64)	1.18 (25)	ns
Bacon (str'ky)	.10 (65)	.05 (58)	ns
Chicken	.72 (56)	.00 (11)	***
Sausages	.93 (72)	.11 (70)	***
Burgers	.38 (74)	.01 (45)	***
Cod Fillets	.00 (17)	.11 (8)	**
Tuna (tinned)	.18 (74)	.02 (78)	***
Fish Fingers	.41 (66)	.12 (29)	**
Butter	.42 (72)	.11 (68)	ns
Margarine	.34 (72)	.27 (64)	*
Vegetable Oil	.49 (71)	.07 (47)	***
Milk (full)	.02 (75)	.00 (106)	***
Milk (semi)	.03 (75)	.00 (106)	***
Yoghurt	.17 (64)	.05 (45)	*

Cheese (Cheddar)	3.11 (72)	.71 (67)	*
Eggs	.16 (75)	.00 (64)	***
Potatoes (new)	.05 (63)	.00 (34)	***
Potatoes (old)	.00 (45)	.00 (53)	***
Chips (frozen)	.00 (74)	.00 (14)	-
Cabbage	.32 (61)	.05 (24)	***
Lettuce (iceberg)	.00 (64)	.05 (36)	***
Carrots	.01 (64)	.00 (42)	***
Cucumber	.00 (64)	.00 (38)	-
Tomatoes (fresh)	.25 (64)	.02 (53)	***
Onions	.00 (64)	.00 (47)	-
Baked Beans	.19 (74)	.02 (83)	***
Tomatoes (tinned)	.17 71)	.02 (40)	***
Peas (frozen)	.53 (70)	.00 (9)	***
Oranges	.03 (57)	.00 (52)	***
Apples	.23 (64)	.08 (60)	ns
Bananas	.00 (64)	.00 (51)	-
Sultanas	.13 (38)	.00 (17)	***
Orange Juice	.77 (75)	.03 (66)	***
Pears	.15 (63)	.05 (29)	***
Sugar	.00 (74)	.00 (78)	-
Jam	.32 (61)	.04 (52)	***
Flour	-	-	-
Tea Bags	.92 (74)	.57 (70)	***
Instant Coffee	1.89 (74)	.58 (82)	ns
Drinking Choc	.10 (63)	.00 (14)	***
Soup (tomato)	.21 (70)	.03 (92)	***
Cola	.48 (74)	.07 (86)	***
Chocolate	.14 (4)	.07 (97)	***

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$)

Shading indicates those food items that have a smaller price range in 'independent' shops

Which foods are cheapest in which shops?

Indicator food groups were constructed to illustrate which sorts of food were cheapest in which type of shop (for the construction of food groups see chapter 2.3.2). Shop type is significantly associated with the price of all the food groups studied. The shaded areas indicate the cheapest shop type and the bold underlined italics indicate the most expensive. Discounters were the cheapest shops in which to buy each food group, except sugar and preserves (S & P), whereas the most expensive place to shop varied considerably although independent grocers (dairy products, fruit and cereals) and delicatessens (breads, sugar and preserves, beverages) were generally the most expensive.

Table 4.13 Mean lowest price of food groups by shoptype

	Mult	**Disc**	**Freez**	**Affil**	**Ind**	**Butch**	**F&V**	**Baker**	**Fish**	**Deli**	***Sig***
	£ (n)	**£ (n)**	**£ (n)**	**£ (n)**	**£ (n)**	**£ (n)**	**£ (n)**	**£ (n)**	**£ (n)**	**£ (n)**	
Breads	.67 (39)	*.54 (25)*	.86 (8)	1.15 (9)	1.25 (64)	-	1.31 (1)	1.22 (13)	-	***1.76 (1)***	***
Fish	.85 (38)	.73 (25)	1.38 (3)	***2.20 (9)***	1.89 (20)	-	-	-	?	-	***
Meat	1.13 (38)	.92 (25)	1.49 (8)	1.90 (4)	2.09 (20)	***3.12 (14)***	-	-	-	-	***
Dairy	4.34 (39)	3.38 (25)	4.99 (8)	5.66 (9)	***6.78 (53)***	-	7.17 (1)	-	-	5.05 (3)	***
Fruit	1.07 (38)	1.03 (19)	-	1.29 (6)	***1.42 (19)***	-	1.23 (18)	-	-	1.27 (3)	***
Veg	.93 (38)	.88 (25)	***1.77 (1)***	1.17 (5)	1.15 (13)	-	1.10 (18)	-	-	-	***
S & P	.12 (36)	.14 (25)	-	1.57 (9)	1.70 (39)	-	-	-	-	***2.14 (1)***	***
Beverage	2.47 (36)	1.68 (25)	3.90 (8)	3.25 (9)	4.66 (46)	-	-	-	-	***7.76 (1)***	***
Cereals	2.23 (37)	1.87 (25)	-	3.40 (9)	***4.00 (34)***	-	-	-	-	-	***

(ns = not significant, *p<0.05, **p<0.01, ***p<0.001)

? Did not sell tinned tuna, *££* = cheapest, ***££*** = most expensive

The biggest differences in price were; for meat, between discounters and butchers; for vegetables, between discounters and freezer stores; and for cereals, between discounters and independent grocers. In each case discounters were substantially cheaper than other shop types.

4.2 Results from the survey: food availability

Food availability by shop type was investigated through the recording of two variables during the survey; is the relevant food item available in the shop (yes/no) and is a specified brand of the relevant food item available in the shop (yes/no)? As with food price the large and bulky tables are presented in Appendix B and details of the analytical techniques used (Chi-Sq) can be found in Chapter 2.6. The results for each are presented below. In each table n/a is used to denote those food items not normally expected to be found in that outlet (for example white bread in a butchers).

Appendix B Table J shows the availability of food items in the survey by shop type. No category of shop recorded perfect food availability in every shop of that type (all expected food items available), with the exception of fishmongers for fish. Though you would expect butchers, bakers and greengrocers to have 100% availability this was not the case. Some outlets that fell into these categories were either out of stock on the day or did not sell those items (such as beefburgers in some butchers). Availability was still very high for those in these shops (with the exception of chicken fillets in butchers) however none recorded perfect availability. Two stores *within* the 'multiple stores' category did have 100% of food items available at the time the shops were surveyed. There seemed to be no clear pattern of availability, though better general availability was found in the multiple and discount stores with most food items being available most of the time (see below). Discounters had the best availability with 48 food items available in 100% of stores, followed by multiples with 18 food items available in 100% of stores. However counts of those food items with availability at greater than 90% of all shops in that category show that these positions are reversed with multiples having the best availability with 51 food items available in 90% of stores and discounters second best with 45 items available in 90% of stores (table 4.14).

Appendix B table K shows the availability of branded food items by shop type. Again, no shop type recorded perfect availability (all expected food items available in every shop of that type). Table 4.15 shows that when compared to table 4.14 multiple stores collectively do not have 100% availability of any branded food items. This may reflect decisions by company buyers to concentrate on own-brands for certain products in certain stores and de-list equivalent branded items. Affiliated independent stores have the greatest number of food items (18 items) with 100% availability in their stores, followed by discounters with 9 items. When we look at items with a greater than 90% availability we can see that multiples are again the most important source of branded foods (33 items), followed by affiliated independents (18 items) and discounters (9 items).

Table 4.14 Number of food items with 100% and >90% availability across all shops in that shop type

Shop type	No of food items with 100% availability across that shop type	No of food items with >90% availability across that shop type
Multiples	18	51
Discounters	42	45
Freezer Stores	13	13
Affiliated Independents	30	30
Independent Grocers	0	3
Butchers	1	3
Fruit & Vegetable Stores	2	9
Baker	2	1
Fishmonger	1	1
Delicatessen	7	7

Table 4.15 Number of branded food items with 100% and >90% availability across all shops in that shop type

Shop type	No of food items with 100% availability across that shop type	No of food items with >90% availability across that shop type
Multiples	0	33
Discounters	9	13
Freezer Stores	4	4
Affiliated Independents	18	18
Independent Grocers	0	2
Butchers	0	2
Fruit & Vegetable Stores	1	0
Baker	0	0
Fishmonger	0	0
Delicatessen	3	0

Problems of comparability in measuring food availability by shop type

It is useful at this point to clarify the difficulties of measuring food availability in a survey such as this. In contrast to many previous studies of this type the categorisation of shop type is more finely grained, recognising the full range of shop formats rather than categorising stores as either large or small. Also, this survey looks at all shops that were selected from a random sample rather than purposively choosing single examples of each store type in varying areas (see Piachaud & Webb, 1996). This has implications for the measurement of availability. Firstly, when recognising that a number of shop formats exist, problems of comparability arise. For example, some specialist shops such as butchers and greengrocers were not expected to sell all the products for a 'modest but adequate diet' and therefore direct comparisons between all shops for the full range of items could not be expected. It is difficult therefore to suggest that any one shop type is 'better' in terms of availability than another for all food items. Secondly random sampling gives a truer picture of food availability in a given area by allowing more than one store of the same type to be selected. However the stock of two shops of the same type may not be similar in terms of the number and range of food items that are available because of local demand on the day of data. This could be one reason why we

did not find 100% availability of all food items in all multiple stores (we expected that we would find 100% food availability in all multiples).

Summary

This chapter has shown that when looking at all shops in our survey sample discounters were generally the cheapest for mean lowest price and branded food items; delicatessens and independents were the most expensive for mean lowest price and branded food items. Multiples had the greatest price ranges, and the smallest price ranges were found in independent grocers and freezer stores. Within the 'multiple stores' sub-sample discounters were the cheapest for mean lowest price and branded food price; freezer stores the most expensive for mean lowest price; and multiples the most expensive for branded items. Multiples had the greatest number of wide price ranges, and freezer stores the greatest number of small price ranges.

Within 'independent stores' affiliated independents were the cheapest for mean lowest price and branded items, independents were the most expensive. Affiliated independents had the greatest number of food items with the widest price range and independents had the most food items with the smallest price range. It was also found that 'small stores' (all independents) were more expensive when compared with 'large stores' (all multiples) for mean lowest price and branded item price. There was a smaller range of prices in 'small stores'.

For food availability, 'large stores' had greater numbers of food items available than 'small stores'. For branded food items small stores had greater numbers of food items with 100% availability but large stores had greater availability at >90%. Within 'large stores' discounters had greater numbers of food items with 100% availability but multiples again had larger numbers at >90%. Within small stores affiliated independents had the best availability at 100% and >90%. However these availability findings must be taken in context with issues of comparability between shop types as outlined above.

As hypothesised, the type of shop in which an individual buys their food plays and important role in the availability and cost of that item. However, the complex nature of the retail market indicates that there is no clear evidence that any one type of shop is

always cheaper or more expensive. However a global view does show that large 'multiple' stores (multiples, discounters, freezer stores) are ***consistently*** cheaper and have more food available than smaller 'independent' stores. In the following chapter we will attempt to unpack the associations between area level of deprivation on food price and availability.

Chapter 5: Area deprivation, food price and food availability

Deprivation has been defined as a state of observable and relative disadvantage compared to the local community, wider society or the nation to which an individual, family or group belongs (Townsend 1987). Measures of deprivation are varied and distinct and differing 'types' of deprivation (relative, absolute, material and social) can be identified. This chapter investigates the association between an area-based measure of material deprivation, Carstairs-Morris DEPCAT, (Carstairs & Morris, 1991) and the price and availability of food. For a fuller discussion of the measure of deprivation used in this study see chapter 2.

As highlighted in chapter 1 a number of studies, some of which exist in the 'grey literature', have found that foods recommended in dietary guidelines may be more expensive and less readily available in more deprived areas (Mooney 1988, 1990, Burrows 1991, Morton 1992, Sooman et al, 1993, West Lothian Poverty Alliance 1998). One oft-quoted study conducted in Hampstead found that a basket of 'recommended' foods and a 'recommended' diet (one that meets NACNE guidelines) were more expensive and less available than alternatives in a range of supermarkets, particularly in those supermarkets which were located in more deprived areas of Hampstead (Mooney 1988, 1990). The healthier basket was found to be 21% more expensive than to the foods-to-be-reduced-basket in the area of Hampstead classed as deprived, the differential between these two baskets was being smaller in the more affluent area at 17%. However both food baskets were found to be cheaper in the poorer area than their equivalents in the more affluent area, a finding which was not mentioned in the text of the paper (see Table 1.1 p.21)

Similar observations have been made in other studies. Burrows et al (1991) found that for a selection of 'basic foods' and their 'healthy alternatives', the healthy alternatives were 4% more expensive than the selection of 'basic foods' in the more deprived area. Sooman et al (1993) also reported that a selection of foods regarded as healthy were more expensive in a poorer area than in a better off area and were relatively more expensive than a 'less healthy' selection in the poorer area than in the better off area. Although the absolute price differences between the rich and poor areas were small, the

authors suggested that the magnitude of price difference would be much greater if the baskets used in the study were constructed for a weeks shopping for a family of four. Availability of food items in the study was found to be greater in the richer area for both the 'healthy' and the 'less healthy' basket. The 'healthy' basket had 65% availability in the more advantaged neighbourhood compared to 48% availability in the less well off area. The less healthy basket had an availability of 90% in the better off area compared to 86% in the poorer area. The availability differential, as well as the price differential, between the two baskets was greater in the poorer than the more affluent area.

Though these few studies suggest that in poor places healthy food is more expensive when compared to less healthy food, there is very little evidence to support the idea that poor places are at particular disadvantage in this respect when compared to more affluent areas. In fact price differences in absolute terms are relatively small between poor and affluent areas (Sooman et al, 1993), or not in the direction one might expect – with both healthy and unhealthy food being cheaper in poorer places when compared to more affluent ones (Mooney, 1990). A direct link between low income and poor nutrition is well established (Boyd Orr, 1937; Dobson et al, 1994; Dowler & Calvert, 1995; Dowler & Dobson, 1997, James et al, 1997), and there is an implicit assumption that the poor face a 'double-disadvantage'; food, particularly healthy food, is more expensive and less readily available in areas where lower income residents live when compared to more affluent areas. This inequality is often blamed upon poor local retail infrastructure (see chapter 3 for an investigation of this). Recent policy, community and media reports (West Lothian Poverty Alliance, 1998; Acheson, 1998; Social Exclusion Unit, 1998) have highlighted the existence of food deserts – poor places where food is hard to access. For example;

> *'Some areas (of England & Wales) have become 'food deserts' exacerbating the problems those on low incomes face in affording a healthy diet'*
> *(SEU, 1998, p.72)*

However, as outlined above, much of the limited amount of empirical evidence available is equivocal and based upon small, sometimes unrepresentative, sample populations in highly localised settings. Healthy food can be found to be more expensive than unhealthy food (e.g. white vs. wholemeal bread; saturated fats vs.

polyunstaurates) and less readily available; however, the general statement that 'food' costs more in deprived areas warrants further investigation. Chapter 5.1 attempts to clarify this debate by investigating the relationship between level of area deprivation and the price and availability of a 'modest-but-adequate' basket of food. Analysis was conducted at three spatial scales; health board 'locality' (used by the Greater Glasgow Health Board for planning purposes); postcode district; and postcode sector. The tables presented in the text of this chapter are a collapsed version of the complete data-set, including only those individual items which show statistically significant differences between types of area. The areas used in the study were categorised into 'more affluent' or 'less affluent' places. More affluent places were categorised as those areas with a DEPCAT of 1-4, less affluent as those with a DEPCAT of 5-7

In this study we have demonstrated that the sampled shops tended to be more prevalent in poorer areas (see chapter 3). It was decided not to change this dichotomous deprivation classification post-hoc to suit the empirical distribution observed in the sample (for example splitting DEPCATs into 1-5 and 6-7). If we had changed the categorisation post-hoc we would have been addressing the question; does price and availability differ between two groups of DEPCATs each containing 50% (or thereabouts) of shops in my sample? This question (and the answer) is less likely to interest policy makers and planners. Also, if the survey was to be repeated several years later to examine longitudinal trends, and the distribution of shops by DEPCAT had changed, the investigator would not be comparing like with like unless classification was based on DEPCAT rather than number of shops observed.

5.1 Food price and area deprivation

We examined whether there was a relationship between varying area levels of deprivation and the price of the 57 food items in the survey. The food price analysis was conducted separately for two distinct sub-samples; all shops and independents. This differs from chapter 4 that also included 'multiple stores' as a separate sub-sample. The number of 'multiple stores' in DEPCATs 1-3 were so small that meaningful comparisons between more and less affluent areas could not be drawn. In each set of bivariate analyses three food price variables were examined; mean lowest price, mean brand price and mean price-range (see chapter 2). These were examined by three area-based indices of deprivation as measured by Carstairs-Morris DEPCAT; health board

locality, postcode district and postcode sector (see chapter 2). As noted above, areas were categorised into more or less affluent places and food price was tested accordingly. The numbers in each analysis vary. Though the 57 food items in the study remain constant some are not appropriate for certain variables e.g. there are less than 57 items in the branded food analysis as some items e.g. meat and fresh loaves of bread do not have 'brands' as such and were thus not included. For fresh fruit and vegetables the 'class' of a fruit and vegetable is substituted for brand (see chapter 2). The analyses were run on the main sample as well as an independent stores sub-sample. The results are presented below. In all tables n = number of stores selling that food item.

5.1.1 Food price by deprivation at health board locality level

All shops

Only 5 out of 57 food items were significantly different in price between more and less affluent localities. Table 5.1 shows the **mean lowest price** of those food items, for more or less affluent localities. The shaded areas indicate those food items which are cheaper in poorer places. All food items which significantly differed in price were cheaper in the less affluent localities. Those foods found to be significantly different in price were a mixture of 'healthy' and 'less healthy' items, healthy items being those which individuals are encouraged to consume more of such as wholemeal bread, onions and orange juice, and less healthy items such sausages and chocolate which individuals are encouraged to consume less of. Price differences ranged from 5 pence for chocolate (19.23%) to 22 pence for sausages (28.21%).

Table 5.1 Mean lowest price food items by more or less affluent locality: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £ (n)*	*Price difference £ (%)*	*Significance (t-test)*
Wholemeal Loaf (small)	.52 (27)	.46 (102)	.06 (13.04)	*
Sausages	1.00 (23)	.78 (119)	.22 (28.21)	*
Onions	.28 (18)	.22(93)	.06 (27.27)	**
Orange Juice	.70 (27)	.58 (114)	.12 (20.69)	*
Chocolate	.31 (13)	.26 (89)	.05 (19.23)	***

(*p<0.05, **p<0.01, ***p<0.00) *(shaded areas indicate cheaper food in poorer places)*

Table 5.2 shows those **branded** food items that differed significantly in mean price for all stores in the sample by more or less affluent locality. Those foods, except Coca-Cola, were cheaper in the less affluent localities. Class 1 Onions were 6 pence cheaper, Napolina tinned tomatoes 7 pence cheaper and Homepride flour 20 pence cheaper. Coca-Cola was 6 pence more expensive. None of the other 41 branded food items differed significantly in price. The magnitude of price difference ranged from 6 pence (5%) for Coca-cola and 20 pence (26.31%) for Homepride flour.

Table 5.2 Mean branded food item price by more or less affluent locality: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Class 1 Onions	.28 (17)	.22 (93)	.06 (21.43)	**
Napolina Tinned Tomatoes	.40 (8)	.33 (38)	.07 (21.21)	**
Homepride Flour	.96 (4)	.76 (26)	.20 (26.31)	*
Coca – Cola	1.20 (17)	1.26 (115)	.06 (5)	*

(*p<0.05, **p<0.01, ***p<0.00) *(shaded areas indicate foods cheaper in poorer places)*

Table 5.3 shows that only 1 item of 57 - flour - had a significant difference in **mean price range** by more or less affluent locality in all stores in the study sample. The other items in the analysis showed no significant differences. Food items with a significantly smaller price range may be indicative of a smaller product range on offer in that locality, or increased price competition.

Table 5.3 Mean price range by more or less affluent locality: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Flour	.14 (6)	.02 (33)	.12 (600)	*

(*p<0.05, **p<0.01, ***p<0.00) *(shaded areas indicate smaller price ranges in poorer places)*

Independent stores

It might be that the influence of multiple-owned store pricing policies may have an effect on the 'all shops' analysis, thus obscuring any price differences between poor and rich places within independent stores. Therefore in addition to analysing the data on all the shops in the sample it was decided to separate out the 'independent stores' to see

whether price differences remained between poor and rich places within this sub-sample[1].

Table 5.4 shows the **mean lowest price** of those food items that showed a statistically significant price difference by more or less affluent health board locality in independent stores. Eight of fifty-seven items were found to significantly differ in price. The majority of those items that recorded a significant difference were cheaper in the poorer localities (7 of 8). The only exception was white baps, which were more expensive. Those foods that are cheaper in poorer localities consist of a mix of 'healthy' (e.g. wholemeal loaf and Weetabix) and 'unhealthy' food (sausages, sugar and chocolate).

Table 5.4 Mean lowest price food items by more or less affluent locality: independent stores, significant results

	More affluent (DEPCAT 1-4) £ *(n)*	*Less affluent (DEPCAT 5-7)* £*(n)*	*Price difference* £ *(%)*	*Significance (t-test)*
Small White Unsliced	.51 (8)	.42 (15)	.09 (21.4)	*
White Baps	.12 (17)	.14 (47)	.02 (16.7)	**
Wholemeal Loaf (small)	.55 (15)	.51 (43)	.04 (7.8)	*
Weetabix	1.34 (8)	1.25 (46)	.09 (7.2)	*
Sausages	1.45 (10)	1.02 (60)	.43 (42.2)	***
Sugar	.84 (12)	.80 (67)	.04 (5)	*
Jam	.93 (9)	.85 (43)	.08 (9.4)	*
Chocolate	.29 (11)	.26 (87)	.03 (11.5)	***

(*p<0.05, **p<0.01, ***p<0.00) *(shaded areas indicate foods cheaper in poorer places)*

Table 5.5 shows the **mean price of branded food** items by more or less affluent locality sold in independent stores. Again the majority of items which showed a statistically significant difference were cheaper in poorer localities (7 of 8 items). When testing the price of branded food items we can assume that the quality of manufacturer branded produce is almost identical wherever it is sold. This allows us to make direct

[1] See page 29 for a definition of independent and multiple stores.

price comparisons by area deprivation and circumvents criticisms of price difference being caused by differing levels of food quality. Tuna, which is more expensive in the poorer localities, is an item the consumption of which health promotion experts would encourage. Those foods that are cheaper in the poorer localities include items that health educators would like to see a reduced consumption of (e.g. sugar, burgers, butter) and those which individuals should eat more of (e.g. cornflakes and weetabix).

Table 5.5 Mean price branded food items by more or less affluent locality: independent stores, significant results

	More affluent (DEPCAT 1-4) £ *(n)*	*Less affluent (DEPCAT 5-7)* £*(n)*	*Price difference* £ *(%)*	*Significance (t-test)*
Cornflakes	1.34 (9)	1.25 (51)	.09 (7.2)	*
Weetabix	1.34 (8)	1.26 (44)	.08 (6.3)	*
Bird's Eye Burgers	1.05 (4)	.99 (26)	.06 (6.1)	**
John West Tuna	.74 (11)	.76 (58)	.02 (2.6)	*
Anchor Butter	1.01 (3)	.91 (40)	.10 (11)	*
Napolina Tinned Tomatoes	.49 (3)	.38 (6)	.11 (28.9)	*
Tate & Lyle Sugar	.84 (11)	.80 (67)	.04 (5)	*
Homepride Flour	.96 (4)	.76 (26)	.20 (26.32)	*

(*p<0.05, **p<0.01, ***p<0.00) *(shaded areas indicate foods cheaper in poorer places)*

Table 5.6 shows eight of fifty-seven food items with **price ranges** that significantly differ by locality deprivation level in independent stores. In 6 of the 8 foods with significant differences the range is smaller in less affluent localities. This could indicate less choice (in terms of price) when compared to the items in the more affluent localities, more price competition, or more responsiveness to local customer poverty.

Table 5.6 Mean price range by more or less affluent locality: independent stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Significance (t-test)*
Dried Spaghetti	.21 (8)	.03 (46)	*
Streaky Bacon	.21 (8)	.03 (50)	*
Margarine	.10 (8)	.30 (56)	*
Eggs	.01 (9)	.00 (55)	*
Tinned Tomatoes	.09 (7)	.01 (33)	***
Flour	.14 (6)	.02 (33)	*
Chocolate	.03 (11)	.07 (87)	**

*(*p<0.05,**p<0.01,***p<0.001) (shaded areas indicate smaller price ranges in poorer places)*

5.1.2 Food price by deprivation at the postcode district level

This next set of tables is concerned with similar analyses to the above but at a smaller geographical scale – the postcode district. Again the analysis is separated into all shops and independent stores.

All shops

Table 5.7 shows the eight of fifty-seven **mean lowest price** of food items which differ significantly by more or less affluent postcode district. All of the items that show statistically significant differences are cheaper in the poorer postcode districts, and could be considered components of a health, modest but adequate diet.

Table 5.8 displays the six of forty-six statistically significant differences for the **mean price of branded food** items by more or less affluent postcode districts. Again the majority of food items whose price differs are cheaper in poorer areas, the exceptions being Kingsmill White Loaf and Coca-Cola. The fresh fruit and vegetables whose prices differ significantly are all cheaper in the poorer places, as is sugar.

Table 5.7 Mean lowest price of food items by more or less affluent postcode districts: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Small White Unsliced	.49 (12)	.44 (36)	.05 (11.4)	*
Wholemeal Loaf (small)	.51 (22)	.47 (107)	.04 (8.5)	*
Onions	.27 (19)	.22 (92)	.05 (22.7)	*
Oranges	.22 (21)	.20 (88)	.02 (10)	*
Orange Juice	.74 (25)	.57 (116	.07 (12.3)	**
Sugar	.78 (26)	.73 (127)	.05 (6.8)	*
Flour	.98 (7)	.80 (32)	.18 (22.5)	*
Coffee	1.53 (30)	1.21 (127)	.32 (26.4)	*

*(*p<0.05, **p<0.01, ***p<0.001) (shaded areas indicate cheaper prices in poorer places)*

Table 5.8 Mean price of branded foods by more or less affluent postcode districts: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Kingsmill Loaf	.56 (18)	.61 (92)	.05 (8.9)	*
Class 1 New Potatoes	.28 (18)	.21 (78)	.07 (33.3)	*
Class 1 Onions	.27 (18)	.21 (78)	.06 (28.6)	*
Class 1 Oranges	.22 (21)	.20 (88)	.02 (10)	*
Tate & Lyle Sugar	.76 (25)	.73 (126)	.03 (4.1)	*
Coca-Cola	1.20 (20)	1.27 (112)	.07 (5.5)	**

*(*p<0.05, **p<0.01, ***p<0.001) (shaded areas indicate cheaper prices in poorer places)*

Table 5.9 shows the **mean price range** of food items with a significant difference by more or less affluent postcode districts. Only one food item of fifty-seven, cod fillets, shows a significant difference. A price range of 0 pence recorded for the less affluent DEPCATs is indicative of only one item being available in each shop where the item is sold.

Table 5.9 Mean price range of food items by more or less affluent postcode districts: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Significance (t-test)*
Cod Fillets	.18 (5)	.00 (20)	*

(*p<0.05, **p<0.01, ***p<0.001) (shaded areas indicate smaller price ranges in poorer places)

Independent shops

We then analysed food prices for independent stores only. Table 5.10 lists the **mean lowest prices** of the eleven of fifty-seven food items in independent stores that showed statistically significantly differences by more or less affluent postcode districts. Nine out of eleven items that significantly differed in price were cheaper in less affluent postcode districts. Both large and small wholemeal loaves were cheaper in the less affluent postcode districts, though the price of a white loaf (again cheaper in poorer postcode districts) was less than both wholemeal varieties. Skimmed milk and baked beans were more expensive in the poorer postcode districts. The relative expense of the skimmed milk may act as a price disincentive to purchase but the absolute difference is small (3 pence). The items that were cheaper in less affluent districts included both those whose consumption is encouraged (wholemeal loaves and orange juice) and discouraged (sugar and chocolate).

Table 5.10 Mean lowest price of food items by more or less affluent postcode districts: independent stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
White unsliced loaf (small)	.53 (6)	.43 (17)	.10 (23.3)	*
Wholemeal Loaf (large)	.76 (14)	.70 (77)	.06 (8.6)	*
Wholemeal Loaf (small)	.55 (10)	.52 (48)	.03 (5.8)	*
Digestives (plain)	.85 (9)	.76 (73)	.09 (11.8)	*
Skimmed Milk	.59 (16)	.62 (91)	.03 (5.1)	*
Baked Beans	.32 (14)	.35 (70)	.03 (9.4)	*
Orange Juice	.92 (12)	.75 (54)	.17 (22.7)	*
Sugar	.84 (13)	.80 (66)	.04 (5)	*
Flour	.98 (7)	.80 (32)	.18 (22.5)	*
Coffee	1.99 (17)	1.60 (66)	.39 (24.4)	*
Chocolate	.28 (12)	.26 (86)	.02 (7.7)	*

(*p<0.05, **p<0.01, ***p<0.001) *(shaded areas indicate cheaper prices in poorer places)*

Table 5.11 shows the **mean price of branded food** items which differed significantly by more or less affluent postcode district (five of forty-six). Three out of the five food items which significantly differed, Kingsmill white loaf and full and skimmed milk, are more expensive in poorer postcode districts. Anchor butter and Tate & Lyle sugar are cheaper in poorer postcode districts. Flour, coffee and orange juice are substantially cheaper in these poorer postcode districts.

The four of fifty-seven items with significant differences in **mean price range** by more or less affluent postcode district is shown in table 5.12. Three out of the four food items with significant differences in price range have a smaller price range in the less affluent postcode districts. Again this could indicate that choice of these items is restricted when

comparing them to the same items in more affluent postcode districts. The items with a significantly larger price range in poorer postcode districts is chocolate.

Table 5.11 Mean brand price of food items by more or less affluent postcode districts: independent stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £ (n)*	*Price difference £ (%)*	*Significance (t-test)*
Kingsmill Loaf	.62 (6)	.67 (53)	.05 (8.1)	**
Anchor Butter	1.00 (6)	.90 (37)	.10 (11.1)	**
Full Milk	.59 (15)	.62 (88)	.03 (5.1)	*
Skimmed Milk	.59 (15)	.63 (88)	.03 (5.1)	*
Tate & Lyle Sugar	.84 (12)	.80 (66)	.04 (5)	*

(*p<0.05, **p<0.01, ***p<0.001) *(shaded areas indicate cheaper prices in poorer places)*

Table 5.12 Mean price range of food items by more or less affluent postcode districts: independent stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Significance (t-test)*
Vegetable Oil	.16 (8)	.05 (40)	*
Eggs	.01 (12)	.00 (52)	*
Baked Beans	.05 (14)	.01 (70)	**
Chocolate	.05 (12)	.07 (86)	*

(*p<0.05, **p<0.01, ***p<0.001) *(shaded areas indicate price range smaller in poorer places)*

5.1.3 Food price by deprivation at the postcode sector level

This section presents a series of tables analysing food price by area deprivation at the postcode sector level. As in sections 5.1.1 and 5.1.2, only significant results are displayed in the following tables. Results from all shops in the sample are followed by results from independent stores only.

All shops

Table 5.13 shows the **mean lowest price** for the five of fifty-seven food items that were significantly different in price by more or less affluent postcode sectors. Four out of five items that differ significantly are cheaper in poorer places (teacakes, sausages, burgers and chocolate). At this geographical scale price differences are larger (though no more statistically significant) than at the two geographical scales previously analysed. Burgers and sausages are on average 17 pence (21.4%) and 11 pence (14.1%) cheaper in poorer areas – a substantial price difference in both relative and absolute terms.

Table 5.14 shows the **mean price of branded food** items by more or less affluent postcode sector. Ten branded food items of the forty-six were significantly different in price. Of those, three of the ten items which display significant differences are cheaper in poorer places (Birds Eye Beefburgers, Birds Eye Fish Fingers and Del Monte Orange Juice). However these price differences are relatively small (1, 6 and 3 pence respectively). Again there is no clear pattern as to the types of food items whose prices differ significantly though some branded items that could be considered healthy are more expensive in poorer postcode sectors.

Table 5.13 Mean lowest price of food items by more or less affluent postcode sectors: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Teacakes	.77 (6)	.68 (16)	.09 (13.2)	*
Sausages	.89 (41)	.78 (101)	.11 (14.1)	*
Burgers	.97 (35)	.80 (84)	.17 (21.3)	*
Apple	.45 (29)	.51 (94)	.06 (13.3)	*
Chocolate	.30 (15)	.26 (86)	.04 (13.3)	***

(*p<0.05, **p<0.01, ***p<0.001) *(shaded areas indicate cheaper prices in poorer places)*

Table 5.14. Mean price of branded foods by more or less affluent postcode sector: all stores, significant results

	More affluent (DEPCAT 1-4) £ (n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Small wholemeal sliced	.47 (13)	.48 (52)	.01 (2.13)	*
Plain digestive biscuits	.70 (26)	.75 (108)	.05 (7.1)	**
Burgers	1.00 (26)	.99 (68)	.01 (1)	*
Fish Fingers	1.20 (14)	1.14 (41)	.06 (5.3)	*
Margarine	.95 (29)	.98 (90)	.03 (3.2)	**
Vegetable Oil	.64 (22)	.68 (68)	.04 (6.3)	*
Sultanas	.85 (2)	.86 (6)	.01 (1.2)	*
Orange Juice	.90 (24)	.87 (56)	.03 (3.5)	*
Tea	1.59 (19)	1.64 (54)	.05 (3.1)	***
Coca-Cola	1.21 (24)	1.26 (107)	.05 (4.1)	**

(*p<0.05, **p<0.01, ***p<0.001) *(shading indicates brand price is cheaper in poorer areas)*

Table 5.15 shows eleven of fifty-seven food items for which the price range differed significantly between more or less affluent postcode sectors. All eleven food items with significant differences in price range show that price range is smaller in the poor postcode sectors. Baking potatoes show a very small difference in absolute terms. Items with large differences in price range include cheese and teacakes – however these isolated items are not particularly indicative of individual 'healthy' or 'unhealthy' diet choices.

Table 5.15 Mean price range of food items by more or less affluent postcode sector: all stores, significant results

	More affluent (DEPCAT 1-4) £(n)	*Less affluent (DEPCAT 5-7) £(n)*	*Significance (t-test)*
Tinned spaghetti	.09 (32)	.06 (108)	*
Teacake	.64 (23)	.19 (42)	**
Burgers	.26 (35)	.23 (84)	*
Cod	.11 (8)	.00 (17)	**
Vegetable Oil	.37 (29)	.31 (89)	**
Yoghurt	.13 (30)	.11 (79)	*
Cheese	2.32 (35)	1.83 (104)	*
Baking Potato	.0038 (21)	.0012 (77)	**
Pears	.17 (24)	.10 (68)	*
Flour	.12 (7)	.02 (32)	**
Chocolate	.08 (15)	.07 (86)	**

(*p<0.05, **p<0.01, ***p<0.001) *(shading indicates price range is smaller in poorer areas)*

Independent Stores

Again we analysed data from 'independent stores' only to try and investigate whether multiple owned formats in the all shops sample levelled out price differences between area-based deprivation measures at the postcode sector level. Table 5.16 shows the twelve of fifty-seven significant differences in **mean lowest priced food** items between more or less affluent postcode sectors. Seven out of twelve food items with significant differences in mean lowest price are cheaper in poorer postcode sectors. Many of these items, in common with the preceding analyses, are items that could be considered to be

unhealthy – items high in fat such as burgers, sausages and frozen chips. Only one fruit and vegetable item, carrots, were cheaper in poorer places but only by three pence per pound. Mean lowest priced food items which are more expensive in poorer postcode sectors include wholemeal loaves, tomatoes and sultanas.

Table 5.16 Mean lowest priced food items by more or less affluent postcode sector: independent store, significant results

	More affluent (DEPCAT 1-4) £(n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Large Wholemeal Sliced Loaf	.71 (15)	.71 (75)	.00 (0)	*
Beef (topside)	3.92 (9)	4.44 (13)	.52 (13.3)	*
Sausages	1.23 (19)	1.03 (51)	.20 (19.4)	**
Burgers	1.68 (12)	1.18 (33)	.50 (42.4)	*
Eggs	.68 (12)	.64 (52)	.04 (6.3)	*
Frozen Chips	1.49 (11)	1.31 (11)	.18 (13.7)	*
Carrots	.26 (10)	.23 (32)	.03 (13)	*
Tomatoes	.64 (11)	.67 (42)	.03 (4.7)	*
Sultanas	.86 (5)	.92 (12)	.06 (7.0)	**
Tomato Soup	.54 (16)	.48 (76)	.06 (12.5)	**
Coke	1.02 (9)	1.24 (77)	.22 (21.6)	***
Chocolate	.29 (13)	.27 (84)	.02 (7.4)	***

(*p<0.05, **p<0.01, ***p<0.001) (*shading indicates price is cheaper in poorer areas)*

Analysis of the **mean price of branded food** items in independent stores by more or less affluent postcode sector (table 5.17) shows that seven of forty-six items in the survey are significantly different in price. Five of these seven items are significantly cheaper in poorer postcode sectors. 'Unhealthy' items such as Birds Eye Beefburgers, McCain Frozen Chips and Class 1 Carrots are cheaper in poorer postcode as well as 'healthier' items such as Del Monte Orange Juice and Allinson's Large Wholemeal Loaves. 'Unhealthy' items such as burgers, frozen chips and sausages seem to be consistently significantly cheaper in poor areas at the postcode sector level. These price

differences may create a price incentive to consume greater amounts of these items in these areas.

Table 5.17 Mean price of branded foods by more or less affluent postcode sector: independent stores, significant results

	More affluent (DEPCAT 1-4) £(n)	*Less affluent (DEPCAT 5-7) £(n)*	*Price difference £ (%)*	*Significance (t-test)*
Large Wholemeal Loaf	.77 (5)	.74 (39)	.03 (4.1)	*
Burgers	1.04 (5)	.99 (25)	.05 (5.1)	***
Vegetable Oil	.82 (2)	.87 (22)	.05 (6.1)	*
Frozen Chips	1.49 (3)	1.31 (11)	.18 (13.7)	*
Carrots	.26 (10)	.23 (32)	.03 (13)	*
Tomatoes	.67 (10)	.68 (42)	.01 (1.5)	*
Orange Juice	1.02 (4)	.87 (13)	.15 (17.2)	**

(*p<0.05, **p<0.01, ***p<0.001) (*shading indicates brand price is cheaper in poorer areas)*

The last table in this section, table 5.18, shows the seventeen of fifty-seven items for which **price range** differs significantly by more or less affluent postcode sector. The shaded areas indicate those items with a smaller price range in poorer areas. Thirteen of the seventeen food items show a smaller range in poorer areas, though differences are relatively and absolutely small. For baps there is a zero price range in for the item in both more or less affluent postcode sectors, however statistical significance is still reached. This is probably due to statistical artefact in the analysis.

Table 5.18 Mean price range of food items by more or less affluent postcode sector: independent stores, significant results

	More affluent (DEPCAT 1-4) £(n)	*Less affluent (DEPCAT 5-7) £(n)*	*Significance (t-test)*
Baps	.00 (16)	.00 (48)	*
Tinned Saghetti	.00 (12)	.01 (61)	*
Plain Digestives	.04 (11)	.01 (70)	**
Bacon	.12 (17)	.02 (41)	**
Sausage	.27 (19)	.06 (51)	***
Burger	.00 (12)	.01 (33)	*
Cod	.30 (3)	.00 (5)	**
Tuna (tinned)	.03 (13)	.01 (65)	*
Fish Fingers	.00 (6)	.16 (23)	*
Full Milk	.01 (17)	.00 (89)	**
Eggs	.01 (12)	.00 (52)	***
Baking Potato	.01 (10)	.00 (43)	***
Tomatoes	.04 (11)	.01 (42)	**
Pear	.09 (7)	.03 (22)	**
Flour	.12 (7)	.02 (32)	***
Coke	.25 (9)	.05 (77)	***
Chocolate	.06 (13)	.07 (84)	*

(*p<0.05, **p<0.01, ***p<0.001) (*shading indicates price range is smaller in poorer areas)*

Summary of Chapter 5.1

The table below (Table 5.19) summarises the results of the food price analyses undertaken in the preceding section. The table refers to the number of food items that were significantly cheaper or had a smaller price range in more deprived areas as a proportion of the total number of food items which reached statistical significance. The table is split in to results for the two samples; all shops and independent stores. For each sample results are presented for the three geographical scales at which deprivation was analysed. The table shows that in all but one case, for all shops in the sample, the majority of foods that show significant differences in price are cheaper or had smaller price ranges in poorer areas

Table 5.19 Summary table of results presented in Chapter 5.1

	Health Board Locality DEPCAT			**Postcode District DEPCAT**			**Postcode Sector DEPCAT**		
	Mean Lowest Price	***Brand Price***	***Price Range***	***Mean Lowest Price***	***Brand Price***	***Price Range***	***Mean Lowest Price***	***Brand Price***	***Price Range***
All Shops	5/5	4/5	1/1	8/8	4/6	1/1	4/5	3/10	11/11
Indep'dent Shops	7/8	7/8	5/7	9/11	2/5	3/4	7/12	5/7	13/17
Total possible foods	**57**	**46**	**57**	**57**	**46**	**57**	**57**	**46**	**57**

Explanatory note: The figures in this table refer to the numbers of food items which were found to be statistically significantly less expensive or have smaller price ranges in more deprived areas. They are expressed as a proportion of the total numbers of food items that showed statistically significant differences at the $p<0.05$, $p<0.01$ or $p<0.001$ level. For example, for brand price at the postcode sector level for all shops 3 of 10 items that reached statistical significance were less expensive in more deprived areas.

The exception to this is brand price at the postcode sector level. This may reflect the higher concentration of independent food retail formats, formats that return higher prices for branded goods in those postcode sectors. The independent stores sub-sample tells a similar story. Of the nine analyses undertaken for the independent stores sub-sample, eight showed that prices were significantly cheaper in less affluent areas or had smaller price ranges. The exception in this case was for brand price at the postcode district level.

It is also worth noting that there are problems with this sort of analysis. At the postcode sector level of analysis the number of items that show significant differences are somewhat higher than at the locality or postcode district level. This may suggest that as the areal unit gets smaller, differences between areas become more significant. This may be due to two interconnected reasons. Firstly, analysing data at smaller spatial scales makes the analysis more robust as using postcode sectors for measuring deprivation at this level allows for more homogeneity of material circumstance within each individual postcode sector. It also allows for more price homogeneity within the smaller areas and thus greater heterogeneity between areas used in the study. Secondly, aggregating up these measures of deprivation to larger geographical scales may tend to obscure differences within these larger areas, and render them non-significant, by making standard deviations between areas smaller. The Carstairs-Morris DEPCAT measure of deprivation was constructed to expressly measure material circumstance at the postcode sector level. Analyses using larger geographical units may be rendered less robust due to the aggregating up of deprivation measures to the locality or postcode district level. This may be one reason why there are fewer significant differences in price and price-range found at these spatial scales.

5.2 Food availability and area level of deprivation

The second part of this chapter is concerned with food *availability* and area level of deprivation. In this section we examine whether there is a relationship between area level of deprivation (as measured at the postcode sector, postcode district and healthy board locality level) and the availability of the 57 food items in the survey. Analysis was again conducted on two sample populations; all shops, and independent stores only. In each set of bivariate analyses three variables were tested against the three area-based indices of deprivation; general availability, branded food item availability, and availability of food item in a specified weight/pack size. Areas were categorised into more or less affluent places (more affluent consisting of DEPCATs 1-4, less affluent consisting of DEPCATs 5-7).

One consideration in the analysis of food availability is how to categorise certain shops as being expected to have a certain availability of individual food items. Logic dictates that certain food items might not be available in certain types of shop, for example, bread in a butchers or fishmongers, meat products in fruit and vegetable stores. With this in mind those food items in our study which were NOT expected to be found in certain shops were excluded from the analysis on a case by case, and item by item basis. Keeping all food items in the analysis, irrespective of shop type, would create a misleading denominator that could skew results and produce erroneous findings. However, in some cases, specialist shops often supplemented their core product ranges with other food items that would not be normally be expected to be available. For example some fishmongers do sell small amounts of bread, meat and vegetables (often of high quality, or a luxury brand). In these instances these cases and items were retained in the analysis. Therefore in each of the results tables '***%***' represents those shops in which a food item was available, expressed as a proportion of those shops where you would expect to find it, '***n***' refers to the actual number of shops in which that food item is found. For example, Table 5.20 shows that in more affluent health board localities a small, unsliced white loaf is available in 40% (14 out of 35) of those shops where you might reasonably expect to find small, unsliced white loaves for sale.

5.2.1 Food availability by deprivation at the health board locality level

The first set of analyses in this section is concerned with food availability and area level of deprivation at the health board locality level. The availability of each food item was examined separately in each sample population and those items that showed statistically significant differences in availability by health board locality are displayed in the following tables.

All shops

Table 5.20 shows food availability by more or less affluent health board locality. Shading indicates those items that are significantly less readily available in poorer localities. Food items that were more likely to be found in more affluent areas were Small White Loaves, Baps and Jam Tarts. Cola was the only item which was more likely to be found in poorer areas (90.3% availability vs. 76.6% in the more affluent neighbourhoods).

Table 5.20 Food availability by more or less affluent health board locality: all stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Small White Loaf (unsliced)	40.0 (14/35)	20.7 (34/164)	* (.016)
Baps	66.6 (24/36)	44.5 (73/164)	* (.016)
Jam Tarts	30.6 (11/36)	14.7 (24/163)	* (.024)
Cola	76.6 (23/30)	90.3 (140/155)	* (.034)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.21 shows the availability of branded food items by more or less affluent health board locality. Three of the forty-six food items in the sample were found to significantly differ between more or less affluent locality. All of these three food items were found to be more available in poorer areas and are snack foods (biscuits, cola and chocolate).

Table 5.21 Availability of branded food items by more or less affluent health board localities: all stores significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
McVities Digestive Biscuits	51.7 (15/29)	76.8 (119/155)	** (.005)
Coca Cola	53.3 (16/30)	74.2 (115/155)	* (.021)
Cadbury's Milk Chocolate	66.6 (20/30)	88.4 (137/155)	** (.002)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.22 shows availability of food items in a standard pack/weight size by more or less affluent health board locality. Four of the fifty-seven items entered into the analysis were found to be significantly different. Three out of these four items were found to be significantly less available in less affluent health board localities. These items were small white loaf, white baps and jam tarts. Again cola was found to be more available by specific pack size in the poor area.

Table 5.22 Availability of food items in a standard pack/weight size by more or less affluent health board locality: all stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Small white unsliced loaf	40.0 (14/35)	20.7 (34/164)	* (.016)
White Baps	66.6 (24/36)	43.9 (72/164)	* (.013)
Jam Tart	30.6 (11/36)	14.6 (24/164)	* (.023)
Cola	73.3 (22/30)	89.0 (138/155)	* (.021)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Independent Stores

This next sub-section lists results of analyses of food availability by more or less affluent areas at the health board locality level for independent stores only. As outlined earlier in this chapter the influence of multiple owned stores in the 'all shops' sample may have a disproportionate effect on the 'all shops' analysis, thus obscuring any availability differences between poor and rich places within independent stores. Separating out these 'independent stores' and analysing them independently will enable us to see whether significant availability differences remain in this sub-sample.

Table 5.23 displays those food items that show significant differences in food availability in independent stores by more or less affluent health board localities. Eleven of the fifty-seven food items in the analysis significantly differed by locality. Eight out of the eleven items were found to be less available in the poorer health board localities. These were small white loaves, baps, wholemeal bread, jam tarts, teacakes, lettuce, oranges and apples. The appearance of 'healthy' items in this list of poorer availability (wholemeal bread, oranges and apples) shows us that, in poorer health board localities, stripping out the presence of multiple stores may increase problems of availability for these food items. This may suggest that independent retailers have a narrower product range than multiples making it less likely that these 'healthy' items are available.

Table 5.23 Food availability by more or less affluent health board locality: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Small White loaf (unsliced)	40.0 (8/20)	14.4 (15/104)	** (.007)
White Baps	80.9 (17/21)	45.2 (47/104)	** (.003)
Wholemeal Bread	76.2 (16/21)	45.2 (47/104)	* (.010)
Jam Tarts	23.8 (5/21)	6.7 (7/104)	* (.016)
Teacakes	31.6 (6/19)	8.6 (9/104)	** (.005)
Milk (Full)	86.7 (13/15)	97.9 (93/95)	* (.031)
Milk (Semi-Skimmed)	86.7 (13/15)	97.9 (93/95)	* (.031)
Lettuce	50.0 (9/18)	24.5 (27/110)	* (.026)
Oranges	63.1 (12/19)	36.4 (40/110)	* (.028)
Apples	68.4 (13/19)	42.7 (47/110)	* (.038)
Cola	60.0 (9/15)	84.2 (80/95)	* (.027)

(*p<0.05, **p<0.01, ***p<0.001) Shading indicates food items relatively less available in poorer areas

Table 5.24 shows the eight of forty-six branded food items that differ significantly in availability by more or less affluent health board locality in independent stores. Two items out of the eight are less available in the less affluent localities. These items are again foods that health promoters are keen to encourage the uptake of (apples and oranges). The foods that are more available tend to be 'unhealthier' items such as sausages, chocolate, biscuits and cola.

Table 5.25 shows significant differences in food availability in a specified weight/pack size by more or less affluent healthy board locality for independent stores. Ten of the fifty-seven items in the analysis differ significantly. Seven out of these ten significant items are found to be less available in the poorer health board localities. These items again contain foods that are beneficial to a healthy diet – lettuce, oranges, wholemeal bread, baps and white loaves.

Table 5.24 Availability of branded food items by more or less affluent health board locality: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
McVitie's Digestive Biscuits	42.8 (6/14)	75.7 (72/95)	* (.011)
Walls Sauasges	5.3 (1/19)	26.9 (31/115)	* (.040)
Flora Margarine	21.4 (3/14)	52.6 (50/95)	* (.029)
Wisemans Milk (semi-skimmed)	80 (12/15)	97.9 (93/95)	* (.002)
Oranges (Class 1)	63.2 (12/19)	36.4 (40/110)	* (.028)
Apples (Class 1)	63.2 (12/19)	33.6 (37/110)	* (.013)
Cola	46.7 (7/15)	82.1 (78/95)	** (.002)
Chocolate	53.3 (8/15)	90.5 (86/95)	*** (.0001)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.25 Availability of food items in a specified weight/pack size by more or less affluent health board locality: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Small White Loaf (unsliced)	40.0 (8/20)	14.4 (15/104)	** (.007)
White Baps	80.9 (17/21)	45.2 (47/104)	** (.003)
Wholemeal Bread (large)	76.2 (16/21)	45.2 (47/104)	** (.010)
Jam Tart	23.8 (5/21)	6.7 (7/104)	** (.015)
Teacakes	31.6 (6/19)	8.6 (9/104)	** (.005)
Milk (Full)	86.7 (13/15)	97.9 (93/95)	* (.031)
Milk (Semi-skimmed)	86.7 (13/15)	97.9 (93/95)	* (.031)
Lettuce	50.0 (9/18)	24.5 (27/110)	* (.026)
Oranges	63.1 (12/19)	36.4 (40/110)	* (.028)
Cola	53.3 (8/15)	82.1 (78/95)	* (.012)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

5.2.2 Food availability by deprivation at the postcode district level

This next section the results of a similar series of analyses to those performed above but using a smaller geographical construct – the postcode district – for indices of area deprivation. Again the analysis is split between the 'all shops' and 'independent stores' sub sample.

All shops

Table 5.26 (next page) shows that six of the fifty-seven food items in the analysis significantly differed in availability by more or less affluent postcode district in all stores in the sample. Only one of the six items which significantly differed in availability was found to be less available in poorer postcode districts (jam tarts). The mix of items with significant differences tended to be 'snack' foods such biscuits, cola and chocolate, and these are more readily available in the poorer postcode districts.

Table 5.26 Food availability by more or less affluent postcode districts: all stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Tinned Spaghetti	61.3 (19/31)	78.6 (121/154)	* (.041)
Jam Tarts	29.4 (10/34)	15.2 (25/164)	* (.047)
Digestive Biscuits	71.0 (22/31)	86.9 (133/153)	* (.026)
Chocolate Digestive Biscuits	68.0 (21/31)	84.3 (129/153)	* (.030)
Cola	77.4 (24/31)	90.2 (139/154)	* (.044)
Chocolate	77.4 (24/31)	90.2 (139/154)	* (.044)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.27 shows the only item out of the forty-six items entered into the analysis that significantly differed by more or less affluent postcode district. This item, McVities Digestives, was more available in poorer postcode districts.

Table 5.27 Availability of branded food items by more or less affluent postcode districts: all stores significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
McVities Digestives	51.6 (31/61)	77.1 (18/23)	**(.004)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.28 shows the availability of food items in a standard pack/weight size by more or less affluent postcode districts. In all, four items out of the fifty-seven entered into the analysis were significantly different in availability. These items were relatively more common in the less affluent postcode districts and again were mainly the snack foods, biscuits and cola.

Table 5.28 Availability of food items in a standard pack/weight size by more or less affluent postcode districts: all stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Tinned Spaghetti	61.3 (19/31)	78.6 (121/154)	* (.041)
Digestive Biscuits	67.7 (21/31)	86.3 (132/153)	* (.012)
Chocolate Digestive Biscuits	64.5 (20/31)	84.3 (129/153)	* (.010)
Cola	74.2 (23/31)	90.0 (137/153)	* (.028)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Independent Stores

We conducted the same set of analyses on the 'independent' stores sub-sample. The results are displayed below. Table 5.29 shows the eight, out of fifty-seven items entered into the analysis, that significantly differed in food availability by more or less affluent postcode districts. More items are found to have significant differences in availability in 'independent stores' than in the 'all shops' sample. Five of the eight food items that significantly differed were found to be less readily available in poorer postcode districts. All of these items are the sorts of foods that are recommended in current dietary guidelines such as new potatoes, cabbage, lettuce, oranges, and bananas. Those items that are relatively more available in poorer postcode districts are items considered relatively 'unhealthy', i.e. high in sugar, salt and fats such as digestive biscuits, cola and chocolate. We therefore have a neatly illustrated scenario where healthy foods are less readily available and unhealthy foods are easier to obtain. This, coupled with price incentives to purchase these unhealthy foods when compared to more affluent areas, creates a double disadvantage.

Table 5.29 Food availability by more or less affluent postcode districts: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Digestive Biscuits	55.5 (10/18)	80.2 (73/91)	* (.025)
New Potatoes	45.5 (10/22)	22.4 (24/107)	* (.026)
Cabbage	29.6 (8/27)	12.9 (16/124)	* (.031)
Lettuce	45.5 (10/22)	24.5 (26/106)	* (.047)
Oranges	59.1 (13/22)	36.4 (39/107)	* (.049)
Bananas	59.1 (13/22)	35.5 (38/107)	* (.039)
Cola	61.1 (11/18)	84.8 (78/92)	* (.019)
Chocolate	66.7 (12/18)	92.4 (85/92)	** (.002)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.30 below shows the availability of branded food items by more or less affluent postcode district. Using branded items allows us to control for the availability of standard quality items when analysing the data. Again, many more items are significantly different in availability than the equivalent analysis using all shops in the sample. Of the forty-six items entered into the analysis, eight were significantly different in availability between more or less affluent postcode districts. Three out of these eight items are less readily available in poorer postcode districts. These are the relatively 'healthier' items (new potatoes, cabbage, and oranges). The majority of items which are relatively more available in poorer postcode districts are again the relatively 'unhealthy' biscuits, cola and chocolate.

Table 5.30 Availability of branded food items by more or less postcode district: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
McVities Digestive Biscuits	44.4 (8/18)	76.9 (70/91)	** (.005)
McVities Choc Digestive Biscuits	50.0 (9/18)	76.9 (70/91)	* (.019)
Wisemans Milk (semi-skimmed)	83.3 (15/18)	97.8 (90/92)	** (.007)
New Potatoes (Class 1)	45.4 (10/22)	21.5 (23/107)	* (.019)
Cabbage (Class 1)	29.6 (8/27)	12.1 (15/124)	* (.022)
Oranges (Class 1)	59.1 (13/22)	36.4 (39/107)	* (.049)
Coca-Cola	50.0 (9/18)	82.6 (76/92)	** (.003)
Cadbury's Chocolate	61.1 (11/18)	90.2 (83/92)	*** (.001)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.31 lists the nine of fifty-seven food items that are significantly more available in more or less affluent postcode districts in a specified weight/pack size for independent stores. Five out of these nine items were less readily available in poorer postcode districts. These items were all relatively 'healthy' fruit and vegetables (new potatoes, cabbage, lettuce, oranges and bananas). Relatively 'unhealthy' snack foods such as biscuits, cola and chocolate were all more readily available in poorer postcode districts.

Table 5.31 Availability of food items in a specified weight/pack size by more or less affluent postcode district: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Digestive Biscuits	50.0 (9/18)	79.1 (72/91)	* (.010)
Digestive Biscuits (Chocolate)	50.0 (9/18)	76.9 (70/91)	* (.019)
New Potatoes	45.4 (10/22)	22.4 (24/107)	* (.026)
Cabbage	29.6 (8/27)	12.9 (16/124)	* (.031)
Lettuce	83.3 (10/12)	24.3 (26/107)	* (.047)
Oranges	59.1 (13/22)	36.4 (39/107)	* (.049)
Banana	59.1 (13/22)	35.5 (38/107)	* (.039)
Cola	55.6 (10/18)	82.6 (76/92)	* (.011)
Chocolate	66.7 (10/15)	92.4 (85/92)	** (.002)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

5.2.3 Food availability by deprivation at the postcode sector level

This next section presents a series of tables analysing food availability by area level of deprivation at the postcode sector level. Results from all shops in the sample are followed by results from 'independent stores' only.

All shops

Table 5.32 shows the availability of food items in all shops in the sample by more or less affluent postcode sectors. Of the fifty-seven items entered into the analysis, ten out of eleven items with significant differences in availability are less readily available in poorer postcode sectors. There is no particular pattern to this result except that a mixture of 'healthy' and 'unhealthy' food items, with meat and meat products tending to dominate, are less readily available in the poorer postcode sectors. Cola is more easily available in the less affluent postcode sectors.

Table 5.32 Food availability by more or less affluent postcode sectors: all stores significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Jam Tarts	31.1 (14/45)	13.6 (21/154)	** (.007)
Beef (Topside)	45.1 (23/51)	26.8 (57/157)	* (.014)
Beef (Mince)	58.9 (30/51)	37.5 (59/157)	** (.008)
Bacon (Streaky)	76.4 (39/51)	53.5 (84/157)	** (.003)
Chicken	51.1 (23/45)	30.3 (44/145)	* (.011)
Sausages	80.4 (41/51)	64.3 (101/157)	* (.028)
New Potatoes	62.2 (28/45)	43.4 (69/159)	* (.026)
Frozen Chips	61.9 (26/42)	43.7 (62/142)	* (.038)
Tomatoes (tinned)	73.8 (31/42)	55.9 (80/143)	* (0.38)
Orange Juice	84.4 (45/53)	64.7 (103/159)	* (.012)
Cola	78.6 (33/42)	90.9 (130/143)	* (.030)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.33 below looks at the availability of branded food items in all stores by postcode sector. Of the forty-six items entered into the analysis, five items significantly differed in availability between more of less affluent postcode sectors. Three of the five items are less available in poorer postcode sectors, Class 1 New Potatoes, Birds Eye Frozen Peas and Del Monte Orange Juice – items which could be beneficial to a 'healthy' diet. Coca-Cola and Cadbury's Chocolate are more readily available in poorer postcode sectors. Cadbury's chocolate being available in 88.1% of those outlets which could be expected to stock it.

Table 5.33 Availability of branded food items by more or less affluent postcode sectors: all stores significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
New Potatoes (Class 1)	62.2 (28/45)	42.7 (68/159)	* (.021)
Birds Eye Frozen Peas	54.8 (23/42)	29.6 (49/165)	* (.018)
Del Monte Orange Juice	55.5 (25/45)	35.8 (57/159)	* (.017)
Coca – Cola	54.8 (23/42)	75.5 (108/143)	** (.009)
Cadbury's Choc	73.8 (31/42)	88.1 (126/143)	* (.023)

(*p<0.05, **p<0.01, ***p<0.001) Shading indicates food items relatively less available in poorer areas

Table 5.34 Availability of food items in a standard pack/weight size by more or less affluent postcode sectors: all stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Jam Tart	30.4 (14/46)	13.6 (21/154)	** (.009)
Beef (topside)	45.1 (23/51)	26.8 (42/157)	* (.014)
Beef (mince)	58.8 (30/51)	37.6 (59/157)	** (.008)
Bacon	76.5 (39/51)	53.2 (84/158)	** (.003)
Chicken	51.1 (23/45)	30.3 (44/145)	* (.011)
Sausage	80.4 (41/51)	63.9 (101/158)	* (.028)
New Potatoes	62.2 (28/45)	43.4 (69/159)	* (.026)
Frozen Chips	61.9 (26/42)	43.7 (62/142)	* (.038)
Tomatoes (tinned)	73.8 (31/42)	55.9 (80/143)	* (.038)
Orange Juice	84.4 (38/45)	64.8 (103/159)	* (.012)
Cola	76.2 (32/42)	89.5 (128/143)	* (.026)
Chocolate	33.3 (14/42)	60.1 (86/143)	** (.002)

(*p<0.05, **p<0.01, ***p<0.001) Shading indicates food items relatively less available in poorer areas

Table 5.34 shows the availability of food items in standard pack/weight sizes. Ten items out of the fifty-seven entered into the analysis were found to be significantly less available in poorer postcode sectors. Two out of the fifty-seven items were significantly more available. Items which are significantly less available tended to be chiefly meat or meat products. Again Cola and Chocolate were more readily available in poorer postcode sectors, Jam tarts, Beef (mince) and Bacon and chocolate all had the strongest relationships.

Independent Stores

We analysed independent stores separately in order to try and determine whether multiple owned formats in the 'all shops' sample influenced availability differences between more or less affluent postcode sectors. Table 5.35 shows the 12 food items that significantly differed in availability by more or less affluent postcode sectors in independent stores. Ten items of these twelve items were significantly less available in poorer postcode sectors, and in common with previous analyses fruit and vegetable

items are present (Cabbage and New Potatoes) though there is general mixture of 'unhealthy and 'healthy' items that are less available. Meat items are also represented. Two items, cola and chocolate, were found to have significantly greater availability in the poorer postcode sectors.

Table 5.35 Food availability by more or less affluent health postcode sectors: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
White Baps	72.7 (16/22)	46.6 (48/103)	* (.026)
Jam Tarts	23.8 (5/21)	6.8 (7/103)	* (.016)
Beef (Topside)	33.3 (9/27)	12.3 (13/106)	** (.009)
Beef (mince)	33.3 (9/27)	15.1 (16/106)	* (.030)
Bacon	62.9 (17/27)	38.3 (41/107)	* (.021)
Chicken	22.2 (6/27)	4.7 (5/106)	** (.003)
Sausage	70.4 (19/27)	47.7 (51/107)	* (.035)
Yoghurt	66.7 (12/18)	37.4 (34/91)	* (.021)
New Potatoes	52.4 (11/21)	21.3 (23/108)	** (.003)
Cabbage	28.6 (8/28)	13.0 (16/123)	* (.042)
Cola	55.5 (10/18)	85.8 (79/92)	** (.003)
Chocolate	72.2 (13/18)	91.3 (84/92)	* (.022)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Table 5.36 shows the availability of branded food items. Three items, New Potatoes, Class 1 Cabbage and Granny Smith apples are significantly less readily available in poorer postcode sectors. McVities Digestive Biscuits, Coca-cola and Cadbury's Chocolate are more readily available in these poorer postcode sectors. Coca-Cola and Cadbury's Chocolate show particularly marked differences in availability (44.4 % v 83.7% and 55.6% v 91.3% respectively by more or less affluent postcode sector level of deprivation.

Table 5.36 Availability of branded food items by more or less affluent postcode sector: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
Small Wholemeal Loaf	13.6 (3/22)	35.3 (36/102)	* (.047)
McVitie's Digestive Biscuits	50.0 (9/18)	75.8 (69/91)	* (.026)
New Potatoes (Class 1)	52.3 (11/21)	20.4 (22/108)	** (.002)
Cabbage (Class 1)	28.6 (8/28)	12.2 (15/123)	* (.030)
Granny Smith Apples (Class 1)	57.1 (12/21)	33.9 (37/109)	* (.045)
Coca-Cola	44.4 (8/18)	83.7 (77/92)	*** (.000)
Cadbury's Chocolate	55.6 (10/18)	91.3 (84/92)	*** (.000)

(*p<0.05, **p<0.01, ***p<0.001) Shading indicates food items relatively less available in poorer areas

Table 5.37 shows significant differences in availability for specified weight and pack sizes of food items. Of the fifty-seven food items entered into the analysis eleven food items significantly differed between more or less affluent postcode sector. Nine of the eleven items were relatively less available in poorer postcode sectors. These items are almost identical to those found in table 5.34 and contained mainly meat and meat products, and two vegetable items (new potatoes and cabbage). The two remaining

items, cola and chocolate, had significantly greater availability in these less affluent postcode sectors.

Table 5.37 Availability of food items in a specified weight/pack size by more or less affluent postcode sectors: independent stores, significant results

	More affluent (DEPCAT 1-4) % (n)	*Less affluent (DEPCAT 5-7) % (n)*	*Significance (χ^2)*
White Baps	72.7 (16/22)	46.6 (48/103)	* (.026)
Jam Tarts	22.7 (5/22)	6.8 (7/103)	* (.021)
Beef (Topside)	33.3 (9/27)	12.3 (13/106)	** (.009)
Beef (Mince)	33.3 (9/27)	15.1 (16/106)	* (.030)
Bacon	62.9 (27/43)	38.3 (41/107)	* (.021)
Chicken	70.4 (19/27)	47.7 (51/107)	* (.035)
Yoghurt	66.7 (12/18)	37.4 (34/91)	* (.021)
New Potatoes	52.3 (11/21)	21.3 (23/108)	** (.003)
Cabbage	28.6 (8/28)	13.0 (16/123)	* (.042)
Cola	50.0 (9/18)	83.7 (77/92)	** (.002)
Chocolate	72.2 (13/18)	91.3 (84/92)	* (.022)

(*p<0.05, **p<0.01, ***p<0.001) *Shading indicates food items relatively less available in poorer areas*

Summary of Chapter 5.2

The table below (table 5.38) summarises the results of the food availability analyses presented above. This table refers to the number of food items that were significantly less available, at a significance level of p<0.05 or less, in more deprived areas as a proportion of the total number of items which showed statistically significant differences in availability by area level of deprivation (at the health board locality, postcode district and postcode sector level). This is split by all shops and the independent stores sub-sample. As can be seen the majority of food items that were significantly statistically different in availability were found to be relatively less available in more deprived areas. In the all shops sample, branded food items at the locality level, and all availability types at postcode district level, were found to be

Table 5.38 Summary table of results presented in Chapter 5.2

	Health Board Locality			Postcode District			Postcode Sector		
	Food Item Available	*Branded Item Available*	*Packsize/ Weight Available*	*Food Item Available*	*Branded Item Available*	*Packsize/ Weight Available*	*Food Item Available*	*Branded Item Available*	*Packsize/ Weight Available*
All Shops	3/4	0/3	3/4	1/6	0/1	0/4	10/11	3/5	10/12
Indep'dent Shops	8/11	2/8	7/10	5/8	3/8	5/9	10/12	3/7	9/11

Explanatory note: The figures in this table refer to the numbers of food items which were found to be statistically significantly less available in more deprived areas. They are expressed as a proportion of the total numbers of all food items that showed statistically significant differences at the $p<0.05$, $p<0.01$ or $p<0.001$ level. For example, for branded items at the postcode sector level for all shops 3 of 5 items that reached statistical significance were less available in more deprived areas.

relatively *more* available in deprived areas. In the independent stores sub-sample branded food items at all three geographical scales were relatively *more* available in deprived areas.

Chapter 5.2 has shown that the availability of food items in the survey is not even across three area levels of deprivation. Although there are no clear patterns there is a general trend that demonstrates that **some** fruit and vegetable items are less available in poorer areas and some 'comfort foods' such as chocolate, cola and biscuits are more available in poorer areas. We can also make some general points about food availability within the study samples.

Within the 'all shops' sample and the 'independent stores' sample those items which are significantly more available in poorer areas tend to be those that health educators recommend a reduced consumption of. This coupled with the price incentives to consume unhealthy items in more deprived areas, as noted in section 5.1, creates a double incentive to eat unhealthily. However the numbers of these items are relatively small compared the number of items in the basket survey (especially in the 'all shops' sample at postcode district level). Those 'unhealthy' foods such as cola, chocolate, biscuits and sausages that are cheaper and more readily available in poorer areas do not aid individuals who want to make healthy choices. When looking at branded food items we can see a similar pattern occurring though it is not quite as pronounced.

Independent stores often have a lower availability of 'healthy items' particularly certain items of fruit and vegetables at the postcode district level. Independent stores also show greater variation in availability between poorer and richer areas than the 'all shops' sample suggesting greater disparities between stocking decisions made by independent store owners as compared to multiple store owners. This would be expected from sole-owned businesses and may be a function of a lack of availability from wholesalers of through stocking decisions of the shop owners' themselves.

The areal units that returned the most interesting results are for independent stores at postcode district level. Most food items which were significantly less available in poorer postcode districts tended to be fruit and vegetables. The Competition Commission (2000), in an isochrone analysis of local retail markets, defines an ideal

range to supermarkets of 15-20 minutes travel time. Postcode districts may be reasonably considered as areas of a size that individuals are most likely to range, in this travel time frame, in to shop for food. Why should fruit & vegetables be less available in larger geographical areas than in smaller areas such as postcode sectors? There may be greater heterogeneity between postcode sectors within certain postcode districts which would account for smaller mean availability over larger numbers of shops in postcode districts but conversely greater mean availability in certain of the smaller postcode sectors within them. These smaller postcode sectors might then reflect more or less difference when it comes to aggregating these areal units into more or less affluent postcode sectors than the postcode districts from which they originated – a classic example of the modifiable areal unit problem. This may possibly be a by-product of socio-spatial polarisation at a small area scale caused by the planning process.

A methodological point that needs to be considered when looking at these results is the question of absolute availability. In this chapter the analysis looks at relative availability between area-based measures of deprivation. The significant results returned in section 5.2 are the product of relative difference. Therefore significant results may only compare, for example, 15% vs. 30% availability, both of which are low. What therefore is a level of acceptable availability within a group of shops or areas? This will be considered in Chapter 7.

Chapter 6: Predicting the price and availability of food; the relative importance of shop type, shop location and area level of deprivation

Chapters 3,4 and 5 have investigated the location and distribution of shops, and the impact of shop type and area level of deprivation on food price and availability. This chapter seeks to explore the relative importance of these independent variables in order to help explain variations in food price and availability within the study sample. Several questions are addressed. Firstly, are differences in food price and availability completely explained by shop type, shop location and local area deprivation? Secondly, which is the most important independent variable determining food price and availability – shop type, shop location, and local area deprivation? Finally, how much and what proportion of the variation in food price and availability can be attributed to the independent variables used in this study? In this study the statistical techniques GLM (General Linear Modelling) and Logistic Regression are used to attempt to answer these questions. These techniques make it possible to study the relationship between the independent variables (shop-type, local area deprivation & shop location) and each individual dependent variable (such as mean lowest food price). The techniques used in this chapter have been discussed in Chapter 2.6.

6.1 The dependent variables

The results presented in this chapter are for two outcome (dependent) variables, individual food price and availability. Table 6.1 shows the outcome variables tested in this analysis. GLM assumes a normal distribution of dependent values in the study sample.

Figure 6.1 shows an example of the conditional normal distribution of values for white sliced bread. Conceptually, as stated in chapter 2, we are dealing with the distribution of food prices of different product types (low cost, normal and premium) sold in different shop types (Multiples, Discounters etc). Logically, product types will be nested in some shop types (eg low cost in multiples and discounters, premium in multiples and delicatessens). Within each shop type there is a normal distribution of values for each product type thus making GLM an appropriate tool for analysis. For example in Figure 6.1 for multiples (red line) and freezer stores (blue line) there are two distinct price

peaks. The lowest priced peaks represent 'value' or 'own-label' goods clustered together, and the higher priced peaks represent premium or manufacturer branded goods. Each of these peaks is normally distributed around their product bracket. Value ranges were created by supermarkets to combat the entrance of limited line food discount stores from continental Europe. In effect they are a supermarket brand range which consist of a limited number of core, everyday, products such as white bread, baked beans and washing powder, sold at a very low price and often of mediocre quality. These items were sometimes sold at a very low price to entice people into the store, a famous example being tinned baked beans in the mid 1990's being sold for between three and six pence per can in stores in the Midlands. Examples of these ranges include Tesco 'Value' products and Sainsburys' Essentials.

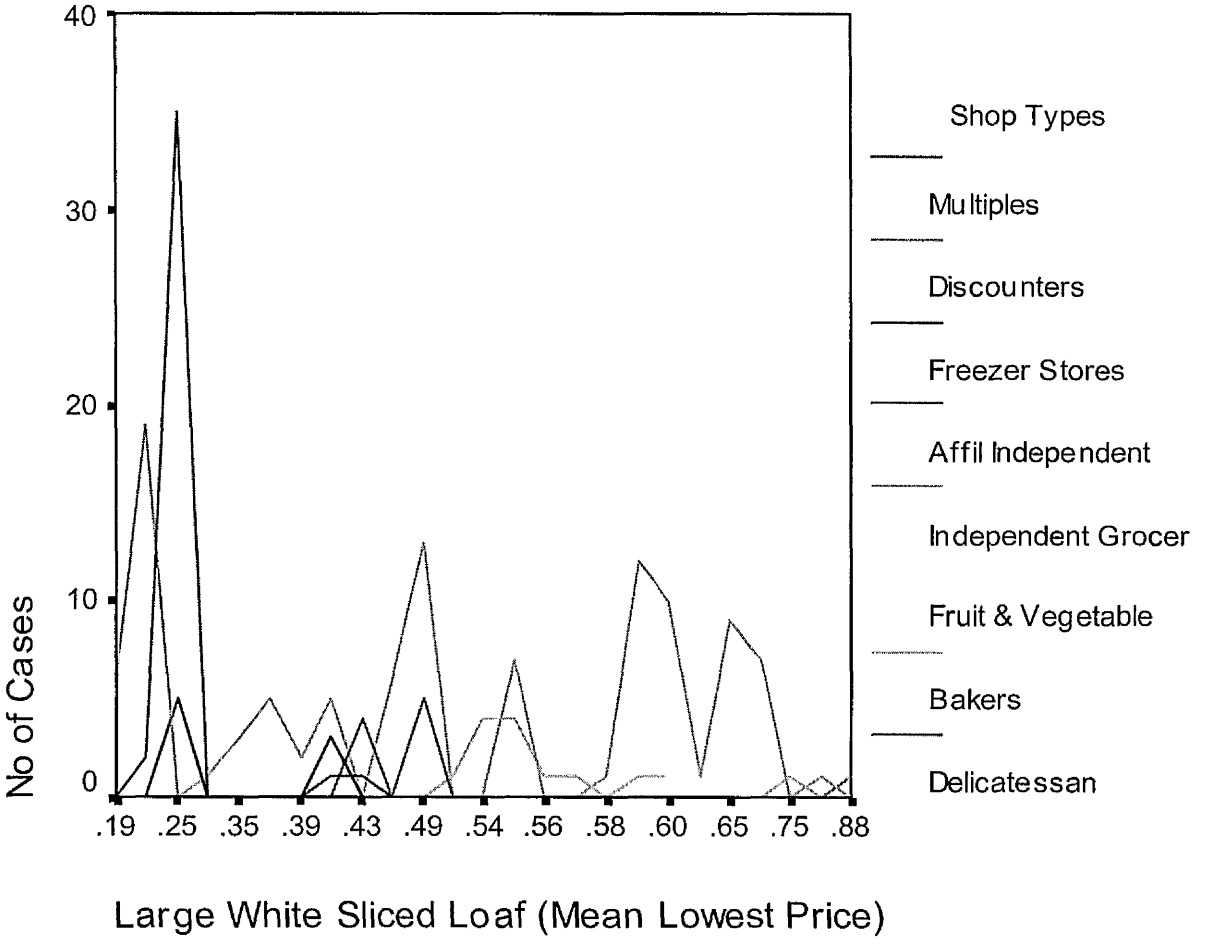
Table 6.1 Permutations of outcome (dependent) variables used in the GLM analysis

Food Items	***Shops Sample***	***Price Variable***
Individual Food items	*All shops*	Lowest Price
		Brand Price
		Price Range
Individual Food items	*Multiple Stores*	Lowest Price
		Brand Price
		Price Range
Individual Food items	*Independent Stores*	Lowest Price
		Brand Price
		Price Range
Food Items	***Shops Sample***	***Availability Variable***
Individual Food items	*All shops*	Item available
		Branded item available
		Item weight/size available
Individual Food items	*Multiple Stores*	Item available
		Branded item available
		Item weight/size available
Individual Food items	*Independent Stores*	Item available
		Branded item available
		Item weight/size available

Most large multiple owned retail formats now have low-cost ranges to varying extents (and more recently multiple retailers have extended their product range into high quality versions of their retail brands such as Safeways' 'The Best'). These products may therefore have created an apparently bimodal distribution of 'mean lowest food price' when we consider all prices together. However, conceptually, they represent two distinct product types, each of which is normally distributed within one shop type.

We also tested two sub-samples of the main data set; 'multiple-owned stores' and 'independent stores' to investigate if these sub-samples behaved differently compared to all the shops in the sample. Bivariate results and descriptions of analysis of food price and availability by area deprivation, shop type and shop location can be found in chapters 3, 4 and 5.

Figure 6.1 Graph showing the distribution of mean lowest price variables in the sample by shop stype; the example of white bread.



6.2 The independent variables

Previous chapters have used bivariate analysis and GIS to describe and investigate the influence of shop location (Chapter 3), shop type (Chapter 4) and area deprivation as measured by DEPCAT (Chapter 5) on individual food price and availability. In this chapter these three independent variables are analysed simultaneously in order to discover how much of the variation in dependent (outcome) variables can be explained by the entered independent variables. In this chapter the independent variables are shop location by health board locality, shop type, and postcode sector level of deprivation as measured by DEPCAT. Locality was used (as opposed to postcode district or postcode sector) as at the time of the survey localities were used for health board planning purposes and health needs assessment. Postcode sector DEPCATs were used (as opposed to using postcode district and health board locality DEPCATs) because Carstairs-Morris DEPCAT was originally devised to investigate mortality in postcode sector units and is therefore the most accurate scale for the area-based measure of deprivation used in the study. As in previous chapters shop type is categorised into 10 separate 'types' (see page 27). We could have entered *all* the available measures of location and deprivation into the same analysis, however it would have rendered the model useless as each of the separate location and deprivation variables would have been confounded as some variables are related to each other. For example the variable 'postcode district DEPCAT' is derived from 'postcode sector DEPCAT' and health board 'localities' are created from 'postcode sectors'.

6.3 Investigating the relative importance of area deprivation, shop type and shop location using General Linear Modelling (GLM) and Logistic Regression to explain variations in the price and availability of food

General Linear Modelling (GLM) is a general procedure for the analysis of variance and covariance, as well as regression. Using a GLM approach in our analysis of food price we can answer the three questions posed at the start of this chapter. Are differences in food price completely explained by shop type, shop location and deprivation? Which is the most important independent variable determining food price? How much and what proportion of the variation in food prices can be attributed to the three independent variables used in this study? Logistic regression rather than GLM was used for the analysis of food availability due to the dichotomous categorical nature of the data (food

available / not available). The results for food price and food availability are presented separately.

6.3.1 Explaining variations in food price: results

This first section deals with explaining variations in the price of food. GLM models were run for each of the dependent price variables (lowest price, brand price and price range) for all shops and all foods in the study sample These analyses are repeated for the sub-samples 'multiple stores' and 'independent stores' that have been defined and used in chapters 4 and 5. In each set of results, each sub-sample is dealt with in turn, starting with results for 'all shops' and continuing with 'multiple stores' then 'independent stores'. The independent variables used are postcode sector DEPCAT, locality and shop type. The independent variables were entered simultaneously into each GLM model which were run for each individual food item (for lowest price, brand price and price range). The rows in each of the following tables show each food item (the dependent variable) with the Eta Sq value and the level of significance (if appropriate) of each of the independent variables. The Eta Sq value measures the relative importance of each ***individual*** independent variable in explaining the variation in each dependent variable. For example an Eta Sq value of 0.5 would mean that 50% of the variation in the dependent variable (eg lowest price for potatoes) is accounted for by the independent variable (eg the shop type). The adjusted R Squared value indicates how much of that variation is accounted cumulatively for by ***all*** three independent variables entered into the analysis. As above, an adjusted R Squared of 0.5 would mean that 50% of the variance in the dependent variable (eg lowest price for potatoes) is accounted for by all three independent variables in the analysis (shop type, shop location and area deprivation). In some cases (described later) a minus value is ascribed to adjusted R Squared values – this simply signifies that the independent variables in the analyses do not explain the variance in that dependent variable. The usual convention of significance is used throughout (*$p<0.05$, **$p<0.01$, ***$p<0.001$).

All shops

Table 6.2 summarises the results for a series of GLMs where the independent, predictive values of locality of shop location, DEPCAT and shop type are examined seperately for the lowest price of each individual food item. Shop type is most predictive of lowest price in 50 of 57 lowest price food items (in nearly all cases shop

type returned the greatest number of significant relationships with mean lowest food price of all the independent variables in the analysis). Shop type accounted for between 18 – 95.1%, respectively (Margarine and Drinking Chocolate) of variations in lowest price – high values for this sort of analysis. This coupled with a statistical significance of $p<0.001$ for these variables suggests that within this analysis, shop type is the most important predictor of price variation. Health Board Locality of shop location was a significant predictor of price variation in twenty-four of fifty-seven foods. Postcode sector level of deprivation does not figure particularly strongly as a predictor of price variation only four food items having their lowest price significantly predicted by postcode sector DEPCAT– this will be discussed in Chapter 7. The proportion of variance explained by these three independent variables together differs for different food items accounting for between 0.03% (for chicken) to 93.8% (for Drinking Chocolate). There are also a number of food items whose price variation is not explained by the model. The lowest price of teacakes, beef (topside), bacon, cod fillets and cabbage was not predicted by any of the three independent variables independently or collectively.

Table 6.2 Results of a series of GLMs on independent variables for lowest price for each food item for 'all shops'.

Food Item (Lowest Price)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	**.058**	**.794 *****	**.116**
Adjusted R Squared .787			
White Loaf (sml unsliced)	**.286**	**.568 *****	**.243**
Adjusted R Squared .436			
Baps (white)	**.069**	**.665 *****	**.205**
Adjusted R Squared .612			
Wh'meal Loaf (lge sliced)	**.049**	**.839 *****	**.183 ***
Adjusted R Squared .818			
Wh'meal Loaf (sml sliced)	**.017**	**.305 *****	**.182**
Adjusted R Squared .327			
Cornflakes	**.079**	**.757 *****	**.157**
Adjusted R Squared .733			
Weetabix	**.097**	**.751 *****	**.264 ***
Adjusted R Squared .759			
Dried Spaghetti	**.123**	**.837 *****	**.256 ***
Adjusted R Squared .817			
Tinned Spaghetti	**.074**	**.838 *****	**.129**
Adjusted R Squared .826			
Jam Tart	**.223**	**.856 *****	**.396**
Adjusted R Squared .828			
Digestive Biscuits	**.062**	**.809 *****	**.064**
Adjusted R Squared .796			
Digestive Biscuits (Chocolate)	**.076**	**.789 *****	**.288 *****
Adjusted R Squared .793			
Teacakes	**.477**	**.676**	**.854**
Adjusted R Squared .589			
Beef (Topside)	**.085**	**.126**	**.147**
Adjusted R Squared -.051			
Beef (Mince)	**.090**	**.527 *****	**.196**
Adjusted R Squared .452			
Bacon	**.057**	**.728 *****	**.167**
Adjusted R Squared .704			
Chicken	**.054**	**.149**	**.237**
Adjusted R Squared .003			
Sausages	**.087**	**.737 *****	**.179**
Adjusted R Squared .728			
Beefburgers	**.042**	**.855 *****	**.208**
Adjusted R Squared .865			
Cod Fillets	**.146**	**.009**	**.450**
Adjusted R Squared .-.337			
Tuna	**.026**	**.939 *****	**.105**
Adjusted R Squared .936			
Fish Fingers	**.122**	**.805 *****	**.210**
Adjusted R Squared .783			
Butter	**.088**	**.769 *****	**.146**
Adjusted R Squared .753			
Margarine	**.013**	**.180 *****	**.084**
Adjusted R Squared .082			
Vegetable Oil	**.037**	**.590 *****	**.191**
Adjusted R Squared .565			
Full Milk	**.050**	**.759 *****	**.123**
Adjusted R Squared .754			
Skimmed Milk	**.055**	**.760 *****	**.113**
Adjusted R Squared .751			

Yoghurt			
Adjusted R Squared			
Cheese	**.023**	**.854 *** **	**.176**
Adjusted R Squared .837			
Eggs	**.050**	**.553 *** **	**.106**
Adjusted R Squared .485			
New Potatoes	**.010**	**.341 *** **	**.136**
Adjusted R Squared .193			
Old Potatoes	**.030**	**.323 *** **	**.448**
Adjusted R Squared .421			
Frozen Chips	**.092**	**.876 *** **	**.146**
Adjusted R Squared .863			
Cabbage	**.136**	**.565 *** **	**.372 * **
Adjusted R Squared .591			
Lettuce	**.045**	**.139**	**.195**
Adjusted R Squared .124			
Carrot	**.095**	**.491 *** **	**.231**
Adjusted R Squared .444			
Cucumber	**.119**	**.580 *** **	**.277**
Adjusted R Squared .607			
Tomatoes	**.039**	**.549 *** **	**.250**
Adjusted R Squared .573			
Onions	**.107**	**.621 *** **	**.295 ** **
Adjusted R Squared .623			
Baked Beans	**.050**	**.878 *** **	**.154**
Adjusted R Squared .864			
Tinned Tomatoes	**.053**	**.887 *** **	**.209**
Adjusted R Squared .886			
Frozen Peas	**.115**	**.871 *** **	**.326**
Adjusted R Squared .851			
Oranges	**.106**	**.475 *** **	**.405 *** **
Adjusted R Squared .544			
Apples	**.030**	**.619 *** **	**.202**
Adjusted R Squared .613			
Bananas	**.123**	**.329 *** **	**.146**
Adjusted R Squared .224			
Sultana's	**.090**	**.683 *** **	**.234**
Adjusted R Squared .536			
Orange Juice	**.067**	**.843 *** **	**.194**
Adjusted R Squared .826			
Pears	**.231 ** **	**.541 *** **	**.324 * **
Adjusted R Squared .462			
Sugar	**.059**	**.728 *** **	**.223 ** **
Adjusted R Squared .726			
Jam	**.035**	**.830 *** **	**.201**
Adjusted R Squared .834			
Flour	**.064**	**.926 *** **	**.304 * **
Adjusted R Squared .916			
Tea	**.031**	**.422 *** **	**.130**
Adjusted R Squared .364			
Coffee	**.028**	**.613 *** **	**.084**
Adjusted R Squared .587			
Drinking Chocolate	**.154**	**.951 *** **	**.293**
Adjusted R Squared .938			
Tomato Soup	**.104 * **	**.810 *** **	**.119**
Adjusted R Squared .796			
Cola	**.031**	**.804 *** **	**.128**
Adjusted R Squared .790			
Chocolate	**.251 *** **	**.090**	**.259**
Adjusted R Squared .427			

Table 6.3 Results of a series of GLMs on independent variables for brand price of each food item in 'all shops'.

Food Item (Brand Price)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	.186 **	.866 ***	.398 ***
Adjusted R Squared .849			
Wh'meal Loaf (lge sliced)	.211	.812 ***	.423 *
Adjusted R Squared .770			
Wh'meal Loaf (sml sliced)	.163	.142	.395
Adjusted R Squared .268			
Cornflakes	.016	.690 ***	.157
Adjusted R Squared .689			
Weetabix	.026	.804 ***	.223
Adjusted R Squared .821			
Dried Spaghetti	.071	.434 **	.323
Adjusted R Squared .159			
Tinned Spaghetti	.088	.937 ***	.163
Adjusted R Squared .933			
Digestive Biscuits	.065	.424 ***	.067
Adjusted R Squared .419			
Digestive Biscuits (Chocolate)	.037	.701 ***	.318 ***
Adjusted R Squared			
Sausages	.024	.027	.134
Adjusted R Squared -.478			
Beefburgers	.102	.008	.176
Adjusted R Squared -.040			
Tuna	.020	.893 ***	.167
Adjusted R Squared .894			
Fish Fingers	.269	.396 ***	.452
Adjusted R Squared .894			
Butter	.095	.786 ***	.222
Adjusted R Squared .780			
Margarine	.014	.315 ***	.117
Adjusted R Squared .299			
Vegetable Oil	.056	.839 ***	.378 **
Adjusted R Squared .822			
Full Milk	.040	.727 ***	.145
Adjusted R Squared .714			
Skimmed Milk	.024	.692 ***	.078
Adjusted R Squared .679			
Yoghurt	.186	.258	.513
Adjusted R Squared -.116			
Cheese	.038	.567 ***	.442 **
Adjusted R Squared .585			
Eggs	.046	.556 ***	.108
Adjusted R Squared .479			
New Potatoes	.010	.342 ***	.138
Adjusted R Squared .191			
Old Potatoes	.029	.311 ***	.457 ***
Adjusted R Squared .411			
Frozen Chips	.057	.783 ***	.495 *
Adjusted R Squared .732			
Cabbage	.143	.555 ***	.392 *
Adjusted R Squared .594			
Lettuce	.061	.434 ***	.203
Adjusted R Squared .363			
Carrot	.094	.444 ***	.225
Adjusted R Squared .410			

Cucumber	**.119**	**.580 *** **	**.277**
Adjusted R Squared .607			
Tomatoes	**.041**	**.594 *** **	**.260 ***
Adjusted R Squared .613			
Onions	**.107**	**.615 *** **	**.294 ***
Adjusted R Squared .620			
Baked Beans	**.030**	**.897 *** **	**.243 ****
Adjusted R Squared .892			
Tinned Tomatoes	**.280**	**.383 *** **	**.373**
Adjusted R Squared .426			
Frozen Peas	**.209**	**.700 *** **	**.276**
Adjusted R Squared .696			
Oranges	**.106**	**.475 *** **	**.405 *** **
Adjusted R Squared .544			
Apples	**.022**	**.355 *** **	**.083**
Adjusted R Squared .287			
Bananas	**.135**	**.293 *** **	**.166**
Adjusted R Squared .206			
Orange Juice	**.059**	**.770 *** **	**.352 ***
Adjusted R Squared .742			
Pears	**.149**	**.230 ***	**.142**
Adjusted R Squared .076			
Sugar	**.059**	**.722 *** **	**.223 ****
Adjusted R Squared .723			
Jam	**.267**	**.034**	**.549**
Adjusted R Squared .050			
Flour	**.044**	**.264****	**.345**
Adjusted R Squared .302			
Tea	**.145**	**.871 *** **	**.317**
Adjusted R Squared .886			
Coffee	**.073**	**.645 *** **	**.131**
Adjusted R Squared .646			
Drinking Chocolate	**.066**	**.970 *** **	**.396**
Adjusted R Squared .964			
Tomato Soup	**.046**	**.260 *** **	**.180**
Adjusted R Squared .233			
Cola	**.052**	**.719 *** **	**.166**
Adjusted R Squared .729			
Chocolate	**.048**	**.014**	**.261**
Adjusted R Squared .150			

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.4 Results of a series of GLMs on independent variables for the 'price range' of each food item in 'all shops'.

Food Item (Price Range)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	**.051**	**.598 *****	**.080**
Adjusted R Squared .603			
White Loaf (sml unsliced)	**.180**	**.625 *****	**.424**
Adjusted R Squared .467			
Baps (white)	**.051**	**.112**	**.134**
Adjusted R Squared -.037			
Wh'meal Loaf (lge sliced)	**.059**	**.646**	**.184**
Adjusted R Squared .619			
Wh'meal Loaf (sml sliced)	-	-	-
Adjusted R Squared			
Cornflakes	**.042**	**.751 *****	**.171**
Adjusted R Squared .730			
Weetabix	**.127 ***	**.549 *****	**.265 ****
Adjusted R Squared .564			
Dried Spaghetti	**.026**	**.751 *****	**.183**
Adjusted R Squared .724			
Tinned Spaghetti	**.014**	**.572 *****	**.111**
Adjusted R Squared .544			
Jam Tart	**.460**	**.490**	**.330**
Adjusted R Squared .380			
Digestive Biscuits	**.049**	**.770 *****	**.111**
Adjusted R Squared .764			
Digestive Biscuits (Chocolate)	**.040**	**.640 *****	**.139**
Adjusted R Squared .628			
Teacakes	-	-	-
Adjusted R Squared			
Beef (Topside)	**.073**	**.540 *****	**.782 *****
Adjusted R Squared .802			
Beef (Mince)	**.193 ***	**.398 *****	**.297**
Adjusted R Squared .410			
Bacon	**.159 ***	**.342 *****	**.463 *****
Adjusted R Squared .473			
Chicken	**.155**	**.586 *****	**.423 ***
Adjusted R Squared .603			
Sausages	**.046**	**.746 *****	**.166**
Adjusted R Squared .729			
Beefburgers	**.031**	**.498 *****	**.189**
Adjusted R Squared .517			
Cod Fillets	-	-	-
Adjusted R Squared			
Tuna	**.025**	**.733 *****	**.100**
Adjusted R Squared .719			
Fish Fingers	**.099**	**.702 *****	**.249**
Adjusted R Squared .646			
Butter	**.080**	**.692 *****	**.114**
Adjusted R Squared .676			
Margarine	**.057**	**.336 *****	**.111**
Adjusted R Squared .284			
Vegetable Oil	**.025**	**.697 *****	**.150**
Adjusted R Squared .720			
Full Milk	**.031**	**.178 *****	**.101**
Adjusted R Squared .133			
Skimmed Milk	**.013**	**.429 *****	**.105**
Adjusted R Squared .418			

Yoghurt	**.035**	**.665 *****	**.172**
Adjusted R Squared .618			
Cheese	**.021**	**.809 *****	**.140**
Adjusted R Squared .788			
Eggs	**.139 ***	**.825 *****	**.148**
Adjusted R Squared .818			
New Potatoes	**.038**	**.851 *****	**.154**
Adjusted R Squared .821			
Old Potatoes	**.110**	**.647 *****	**.239**
Adjusted R Squared .656			
Frozen Chips			
Adjusted R Squared			
Cabbage	**.086**	**.654 *****	**.116**
Adjusted R Squared .559			
Lettuce	**.030**	**.033 ***	**.234**
Adjusted R Squared .149			
Carrot	**.105**	**.267 *****	**.242**
Adjusted R Squared .253			
Cucumber			
Adjusted R Squared			
Tomatoes	**.103**	**.360 *****	**.196**
Adjusted R Squared .352			
Onions			
Adjusted R Squared			
Baked Beans	**.061**	**.585 *****	**.129**
Adjusted R Squared .560			
Tinned Tomatoes	**.068**	**.712 *****	**.181**
Adjusted R Squared .711			
Frozen Peas	**.111**	**.459 *****	**.347 ***
Adjusted R Squared .423			
Oranges	**.004**	**.935 *****	**.090**
Adjusted R Squared .924			
Apples	**.052**	**.407 *****	**.201**
Adjusted R Squared .436			
Bananas			
Adjusted R Squared			
Sultana's	**.119**	**.429 *****	**.445**
Adjusted R Squared .447			
Orange Juice	**.055**	**.838 *****	**.119**
Adjusted R Squared .826			
Pears	**.086**	**.347 *****	**.162**
Adjusted R Squared .281			
Sugar			
Adjusted R Squared			
Jam	**.095**	**.495 *****	**.175**
Adjusted R Squared .470			
Flour	**.409 ***	**.002**	**.414**
Adjusted R Squared .201			
Tea	**.058**	**.342 *****	**.106**
Adjusted R Squared .285			
Coffee	**.015**	**.697 *****	**.108**
Adjusted R Squared .671			
Drinking Chocolate	**.151**	**.587 *****	**.227**
Adjusted R Squared .478			
Tomato Soup	**.025**	**.739 *****	**.092**
Adjusted R Squared .718			
Cola	**.030**	**.643 *****	**.136**
Adjusted R Squared .620			
Chocolate	**.278 *****	**.041**	**.381 *****
Adjusted R Squared .328			

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.3 shows the results of a series of GLMs for brand price of individual food items. For 40 of 47 food items in this analysis, 'shop type' was the most important predictor of variations in brand price, accounting for between 26% (Tomato Soup) and 97% (Drinking Chocolate) of brand price variation. Again Eta Sq values for shop type in the majority of cases (40 of 47) were highly significant ($p<0.001$). For 7 food items 'locality' had the highest Eta Sq values, though only 1 of those 7 items reported a statistically significant result (Old Potatoes). The adjusted r squared statistic for each food item in the analysis shows that brand price variation is not completely explained by the independent variables entered into the model. The food item with the largest amount of brand price variation explained is Drinking Chocolate, with 96.4% of the variation explained. For those items that have negative adjusted r squared values (sausages, beefburgers and yoghurt) the three entered dependent variables do not explain variation in the brand price variable.

Table 6.4 displays the results of a series of GLMs for the price range of individual food items. 'Shop type' is the most predictive of variation in food item price range for 43 out of 49 items in this analysis. It was also highly significant ($p<0.001$) in all but one case (jam tarts). At most 85.1% (new potatoes) of the variation in price range was explained by shop type. Locality had the greatest Eta Sq values for the remaining 6 items of which 3 items (Topside Beef, Bacon and Chocolate) were highly significant ($p<0.001$). The adjusted r squared values showed that, at most, the independent variables explained 92.4% (for oranges) of the variation in price range. A negative adjusted r squared value was recorded for white baps, indicating that the entered dependent variables did not explain the price range variation for that item.

Multiple Stores

Table 6.5 shows results from a series of GLMs on independent variables for lowest price in the 'multiple stores' sub-sample. Shop type (most probably due to the presence of discounters in the analysis) was the most important factor for variation in lowest price for 37 out of 57 items in the analysis. Of these 37 items, 35 recorded highly significant Eta Sq values ($p<0.001$). For those items it explained between 20% (bananas) and 99.8% (flour) of the variance (cont. page 172)

Table 6.5 Results of a series of GLMs on independent variables for lowest price for each food item for 'multiple stores'.

Food Item (Lowest Price)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	**.048**	**.475 *****	**.269**
Adjusted R Squared .394			
White Loaf (sml unsliced)	**.410**	**.000**	**.482**
Adjusted R Squared -.037			
Baps (white)	**.541**	**.951 *****	**.764 ***
Adjusted R Squared .938			
Wh'meal Loaf (lge sliced)	**.226 ***	**.448 *****	**.365 ***
Adjusted R Squared .473			
Wh'meal Loaf (sml sliced)	**.049**	**.020**	**.269**
Adjusted R Squared .008			
Cornflakes	**.230 ***	**.323 *****	**.305**
Adjusted R Squared .381			
Weetabix	**.163**	**.234 ****	**.394 ***
Adjusted R Squared .309			
Dried Spaghetti	**.296 ***	**.314 *****	**.397 ***
Adjusted R Squared .346			
Tinned Spaghetti	**.189**	**.526 *****	**.280**
Adjusted R Squared .452			
Jam Tart	**.409**	**.307**	**.676**
Adjusted R Squared .313			
Digestive Biscuits	**.225 ***	**.481 *****	**.226**
Adjusted R Squared .458			
Digestive Biscuits (Chocolate)	**.104**	**.861 *****	**.343**
Adjusted R Squared .830			
Teacakes			
Adjusted R Squared .			
Beef (Topside)	**.121**	**.089**	**.195**
Adjusted R Squared -.197			
Beef (Mince)	**.056**	**.580 *****	**.150**
Adjusted R Squared .473			
Bacon	**.144**	**.488 *****	**.324**
Adjusted R Squared .409			
Chicken	**.096**	**.068**	**.266**
Adjusted R Squared -.121			
Sausages	**.150**	**.560 *****	**.308**
Adjusted R Squared .500			
Beefburgers	**.056**	**.099**	**.343 ***
Adjusted R Squared .196			
Cod Fillets	**.264**	**.000**	**.718**
Adjusted R Squared .-.229			
Tuna	**.047**	**.693 *****	**.186**
Adjusted R Squared -.649			
Fish Fingers	**.123**	**.195 ****	**.309**
Adjusted R Squared .294			
Butter	**.092**	**.539 *****	**.265**
Adjusted R Squared .495			
Margarine	**.099**	**.144 ***	**.264**
Adjusted R Squared .119			
Vegetable Oil	**.116**	**.654 *****	**.310**
Adjusted R Squared .659			
Full Milk	**.088**	**.573 *****	**.207**
Adjusted R Squared .582			
Skimmed Milk	**.088**	**.573 *****	**.207**
Adjusted R Squared .582			

Yoghurt			
Adjusted R Squared			
Cheese	**.104**	**.654 *** **	**.314**
Adjusted R Squared .587			
Eggs	**.083**	**.547 *** **	**.140**
Adjusted R Squared .439			
New Potatoes	**.169**	**.608 *** **	**.321**
Adjusted R Squared .543			
Old Potatoes	**.388**	**.588 *** **	**.464**
Adjusted R Squared .538			
Frozen Chips	**.086**	**.604 *** **	**.141**
Adjusted R Squared .548			
Cabbage	**.162**	**.004**	**.272**
Adjusted R Squared -.018			
Lettuce	**.149**	**.015**	**.217**
Adjusted R Squared .020			
Carrot	**.148**	**.535 *** **	**.366**
Adjusted R Squared .479			
Cucumber	**.214**	**.053**	**.259**
Adjusted R Squared .038			
Tomatoes	**.081**	**.602 *** **	**.196**
Adjusted R Squared .558			
Onions	**.191**	**.759 *** **	**.333**
Adjusted R Squared .746			
Baked Beans	**.085**	**.757 *** **	**.240**
Adjusted R Squared .729			
Tinned Tomatoes	**.125**	**.589 *** **	**.304**
Adjusted R Squared .526			
Frozen Peas	**.164**	**.562 *** **	**.348**
Adjusted R Squared .554			
Oranges	**.049**	**.135 ***	**.203**
Adjusted R Squared -.031			
Apples	**.207**	**.112**	**.384**
Adjusted R Squared .153			
Bananas	**.304 ***	**.200 ****	**.352**
Adjusted R Squared .264			
Sultana's	**.331**	**.642 *** **	**.479**
Adjusted R Squared .570			
Orange Juice	**.127**	**.772 *** **	**.208**
Adjusted R Squared .737			
Pears	**.340 ****	**.301 *** **	**.474 ****
Adjusted R Squared .338			
Sugar	**.111**	**.520 *** **	**.336**
Adjusted R Squared .534			
Jam	**.063**	**.076**	**.206**
Adjusted R Squared -.063			
Flour	**.075**	**.998 *** **	**.220**
Adjusted R Squared .998			
Tea	**.071**	**.018**	**.291**
Adjusted R Squared .015			
Coffee	**.070**	**.504 *** **	**.144**
Adjusted R Squared .414			
Drinking Chocolate	**.185**	**.948 *** **	**.247**
Adjusted R Squared .935			
Tomato Soup	**.223**	**.530 *** **	**.307**
Adjusted R Squared .465			
Cola	**.108**	**.555 *** **	**.246**
Adjusted R Squared .498			
Chocolate	-	-	-
Adjusted R Squared			

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.6 Results of a series of GLMs on independent variables for brand price of each food item in 'multiple stores'.

Food Item (Brand Price)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	.412 *	.801 ***	.632 ***
Adjusted R Squared .748			
Wh'meal Loaf (lge sliced)	.252	.274 *	.280
Adjusted R Squared -.009			
Wh'meal Loaf (sml sliced)	.498	.000	.707
Adjusted R Squared .437			
Cornflakes	.120	.512 ***	.304
Adjusted R Squared .478			
Weetabix	-	1.00	-
Adjusted R Squared 1.00			
Dried Spaghetti	.636	.000	.454
Adjusted R Squared .184			
Tinned Spaghetti	.176	.983 ***	.313
Adjusted R Squared .981			
Digestive Biscuits	.092	.113 *	.160
Adjusted R Squared -.036			
Digestive Biscuits (Chocolate)	.172	.987 ***	.279
Adjusted R Squared .984			
Sausages	-	-	-
Adjusted R Squared -			
Beefburgers	.104	.023	.337
Adjusted R Squared .032			
Tuna	.071	.741 ***	.263
Adjusted R Squared .703			
Fish Fingers	.476	.000	.690
Adjusted R Squared .265			
Butter	.110	.521 ***	.278
Adjusted R Squared .463			
Margarine	.079	.926 ***	.082
Adjusted R Squared .911			
Vegetable Oil	.128	.649 ***	.362
Adjusted R Squared .624			
Full Milk	.253	.916 ***	.382
Adjusted R Squared .870			
Skimmed Milk	.073	.658 ***	.162
Adjusted R Squared .595			
Yoghurt			
Adjusted R Squared			
Cheese	.041	.629 ***	.328
Adjusted R Squared .594			
Eggs	.073	.530 ***	.137
Adjusted R Squared .420			
New Potatoes	.169	.608 ***	.321
Adjusted R Squared .543			
Old Potatoes	.467 *	.616 ***	.565
Adjusted R Squared .601			
Frozen Chips	.069	.001	.489
Adjusted R Squared .017			
Cabbage	.162	.004	.272
Adjusted R Squared -.018			
Lettuce	.149	.015	.217
Adjusted R Squared .020			
Carrot	.175	.498 ***	.366
Adjusted R Squared .480			

Cucumber	**.214**	**.053**	**.259**
Adjusted R Squared .038			
Tomatoes	**.081**	**.602 *****	**.196**
Adjusted R Squared .558			
Onions	**.191**	**.759 *****	**.333**
Adjusted R Squared .746			
Baked Beans	**.074**	**.932 *****	**.339**
Adjusted R Squared .923			
Tinned Tomatoes	**.327**	**.000**	**.387**
Adjusted R Squared -.053			
Frozen Peas	**.217**	**.620 *****	**.330**
Adjusted R Squared .614			
Oranges	**.049**	**.135 ***	**.203**
Adjusted R Squared -.031			
Apples	**.124**	**.074**	**.214**
Adjusted R Squared .038			
Bananas	**.304 ***	**.200 ***	**.352**
Adjusted R Squared .264			
Orange Juice	**.056**	**.552 *****	**.372**
Adjusted R Squared .483			
Pears	**.204**	**.166 ***	**.181**
Adjusted R Squared .040			
Sugar	**.112**	**.516 *****	**.337**
Adjusted R Squared .527			
Jam			
Adjusted R Squared			
Flour	**.314**	**.992 *****	**.427**
Adjusted R Squared .991			
Tea	**.154**	**.338 *****	**.450**
Adjusted R Squared .365			
Coffee	**.200**	**.988 *****	**.412 ***
Adjusted R Squared .987			
Drinking Chocolate	**-**	**1.00**	**-**
Adjusted R Squared 1.00			
Tomato Soup	**.156**	**.684 *****	**.256**
Adjusted R Squared .630			
Cola	**-**	**1.00**	**-**
Adjusted R Squared 1.00			
Chocolate	**-**	**-**	**-**
Adjusted R Squared -			

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.7 Results of a series of GLMs on independent variables for the 'price range' of each food item in 'multiple stores'.

Food Item (Price Range)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced) Adjusted R Squared .553	**.063**	**.611 *****	**.186**
White Loaf (sml unsliced) Adjusted R Squared -.279	**.336**	**.000**	**.520**
Baps (white) Adjusted R Squared -.009	**.178**	**.158**	**.478**
Wh'meal Loaf (lge sliced) Adjusted R Squared .670	**.112**	**.704 *****	**.183**
Wh'meal Loaf (sml sliced) Adjusted R Squared			
Cornflakes Adjusted R Squared .732	**.086**	**.759 *****	**.305**
Weetabix Adjusted R Squared .507	**.167**	**.491 *****	**.368**
Dried Spaghetti Adjusted R Squared .067	**.060**	**.110 ***	**.259**
Tinned Spaghetti Adjusted R Squared .055	**.078**	**.143 ***	**.255**
Jam Tart Adjusted R Squared .632	**.768**	**.766 ***	**.806**
Digestive Biscuits Adjusted R Squared .565	**.087**	**.616 *****	**.192**
Digestive Biscuits (Chocolate) Adjusted R Squared .429	**.082**	**.515 *****	**.290**
Teacakes Adjusted R Squared			
Beef (Topside) Adjusted R Squared			
Beef (Mince) Adjusted R Squared .463	**.228**	**.457 *****	**.357**
Bacon Adjusted R Squared .389	**.115**	**.422 *****	**.263**
Chicken Adjusted R Squared .528	**.161**	**.514 *****	**.439**
Sausages Adjusted R Squared .098	**.038**	**.191 ****	**.223**
Beefburgers Adjusted R Squared .008	**.060**	**.003**	**.298**
Cod Fillets Adjusted R Squared			
Tuna Adjusted R Squared -.068	**.025**	**.129 ***	**.122**
Fish Fingers Adjusted R Squared .755	**.099**	**.777 *****	**.358**
Butter Adjusted R Squared .184	**.108**	**.234 *****	**.234**
Margarine Adjusted R Squared .510	**.070**	**.592 *****	**.177**
Vegetable Oil Adjusted R Squared .531	**.072**	**.554 *****	**.235**
Full Milk Adjusted R Squared .037	**.072**	**.130 ***	**.176**
Skimmed Milk Adjusted R Squared .415	**.045**	**.422 *****	**.239**

Yoghurt	**.085**	**.523 *** **	**.237**
Adjusted R Squared .417			
Cheese	**.092**	**.366 *** **	**.262**
Adjusted R Squared .294			
Eggs	**.213 ***	**.789 *** **	**.247**
Adjusted R Squared .759			
New Potatoes	**.066**	**.828 *** **	**.207**
Adjusted R Squared .789			
Old Potatoes			
Adjusted R Squared			
Frozen Chips			
Adjusted R Squared			
Cabbage	**.130**	**.455 *** **	**.121**
Adjusted R Squared .344			
Lettuce			
Adjusted R Squared			
Carrot	**.137**	**.252 ** **	**.342**
Adjusted R Squared .223			
Cucumber			
Adjusted R Squared			
Tomatoes	**.172**	**.329 *** **	**.320**
Adjusted R Squared .289			
Onions			
Adjusted R Squared			
Baked Beans	**.088**	**.423 *** **	**.264**
Adjusted R Squared .369			
Tinned Tomatoes	**.058**	**.632 *** **	**.243**
Adjusted R Squared .561			
Frozen Peas	**.104**	**.276 *** **	**.365 ***
Adjusted R Squared .332			
Oranges	**.019**	**.919 *** **	**.161**
Adjusted R Squared .899			
Apples	**.104**	**.153 ***	**.199**
Adjusted R Squared .135			
Bananas			
Adjusted R Squared			
Sultana's	**.161**	**.012**	**.545**
Adjusted R Squared .133			
Orange Juice	**.099**	**.756 *** **	**.214**
Adjusted R Squared .712			
Pears	**.118**	**.187 ***	**.159**
Adjusted R Squared .061			
Sugar			
Adjusted R Squared			
Jam	**.151**	**.313 *** **	**.313**
Adjusted R Squared .290			
Flour			
Adjusted R Squared			
Tea	**.026**	**.334 *** **	**.195**
Adjusted R Squared .224			
Coffee	**.041**	**.631 *** **	**.194**
Adjusted R Squared .565			
Drinking Chocolate	**.165**	**.498 *** **	**.253**
Adjusted R Squared .391			
Tomato Soup	**.106**	**.535 *** **	**.275**
Adjusted R Squared .439			
Cola	**.093**	**.447 *** **	**.245**
Adjusted R Squared .376			
Chocolate			
Adjusted R Squared			

(*p< 0.05; **p<0.01; ***p<0.001)

For the remainder of the food items, health board locality of shop location was the most predictive variable for lowest price, but in only 4 out of 17 cases (weetabix, dried spaghetti, sausages and pears) was a significant result recorded (3 items at $p<0.05$ and 1 item at $p<0.01$). The adjusted r squared values at most accounted for 99.8% of price variation in the sample (for flour). A number of negative adjusted r squared values were also recorded for tuna (-0.649), cod fillets (-0.229) and topside beef (-0.197). For these items, the variables entered into the model explained very little of their 'lowest price' variance.

Table 6.6 shows results for brand price in multiple stores. Shop type recorded the highest Eta Sq values for branded food price for 30 out of 43 items in the analysis. Of these, 25 were highly significant ($p<0.001$). The percentage of variance explained was high for all of the branded foods in which shop type was the most important variable accounting for between 34% (tea) and 99.2% (flour) of variation in branded food price. Weetabix is worth mentioning here as 100% of the variation is accounted for by shop type but this does not reach statistical significance. Health board locality of shop location recorded the highest Eta Sq values for 11 food items, however none reached statistical significance. In two cases postcode sector DEPCAT returned the highest Eta Sq values, however they also do not reach significance.

Adjusted r squared values were again highly varied for branded food items ranging from –0.53 (tinned tomatoes) to 1.00 (drinking chocolate and cola). Four items recorded negative adjusted r squared values; wholemeal loaf (large sliced), digestive biscuits, cabbage and tinned tomatoes. In common with previous analyses fruit and vegetable 'branded' (class 1) price variations seem to be chiefly explained by the type of shop in which the item is sold.

Table 6.7 shows results for price range in multiple stores. For 37 out of 44 food items the greatest Eta Sq values were for shop type. Of these 37 items, all of which were significant, 31 were highly significant ($p<0.001$). Shop type explained between 14.3% (tinned spaghetti) and 91.9% (oranges) of price range variation. For the remaining 7 items, health board locality produced the highest Eta Sq values though none of these were statistically significant. Adjusted r squared values ranged from –0.279 (white loaf

small unsliced) to 0.899 (oranges). The amount of total variance explained by all the variables for price range is generally lower than for branded and lowest item price.

Independent Stores

Table 6.8 shows the results of series of GLMs for lowest price food item in independent stores. Health board locality has the highest Eta Sq values in 38 out of 53 food items. The Eta Sq values for this variable range from 0.122 (12.2% variance explained) for margarine to 1.00 (100% variance explained) for frozen peas. However it only reaches significance in 13 out of these 38 cases (5 at $p<0.001$, 5 at $p<0.01$, 3 at $p<0.05$). Shop type returns 27 significant results. In 14 cases shop type has the highest Eta Sq values of which 9 are highly significant (Digestive Biscuits, Chocolate Digestives, Beefburgers, Tuna, Orange Juice, Pears, Jam, Tomato Soup and Cola). The Eta Sq values for shop type range from .019 (1.9% of variance explained) for baps to 0.969 (96.9% of variance explained) for small unsliced white loaf. Four significant results were found for Postcode Sector DEPCAT though in only one case (large white sliced loaf) was the Eta Sq value the highest compared to the other two variables. Adjusted r squared values for all the food items in the analysis ranged from -0.0570 (new potatoes) to 1.00 (drinking chocolate). In most cases a relatively high proportion of variance was explained by the entered variables.

Table 6.9 shows the results of GLM analysis for brand price of food items in independent stores. Forty-three of forty seven items had health board locality of shop location as the most important variable in the analysis. However in only 11 cases was location a significant predictor. In contrast 22 items recorded a significant result for shop type. Though shop type was not the most important variable in most cases, the Eta Sq values were still relatively high showing that shop type, to a large extent, was the biggest contributor to brand price variation, though was not necessarily always statistically significant. Adjusted r squared values for this analysis ranged from -0.582 (new potatoes) to 1.00 (dried spaghetti, frozen peas and drinking chocolate). The negative adjusted r squared values demonstrate that for sausages, new potatoes, tuna, margarine and yoghurt the independent variables entered into the analysis do not explain the brand price variation in these items.

Table 6.8 Results of a series of GLMs on independent variables for lowest price for each food item for 'independent stores'.

Food Item (Lowest Price)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	**.161 ***	**.160 ****	**.213**
Adjusted R Squared .219			
White Loaf (sml unsliced)	**.926 ****	**.969 ****	**.805**
Adjusted R Squared .918			
Baps (white)	**.044**	**.040**	**.313**
Adjusted R Squared .131			
Wh'meal Loaf (lge sliced)	**.078**	**.198 ****	**.350 ***
Adjusted R Squared .294			
Wh'meal Loaf (sml sliced)	**.079**	**.160**	**.293**
Adjusted R Squared .148			
Cornflakes	**.198**	**.098**	**.387**
Adjusted R Squared .171			
Weetabix	**.031**	**.272 ****	**.447**
Adjusted R Squared .451			
Dried Spaghetti	**.081**	**.043**	**.495**
Adjusted R Squared .190			
Tinned Spaghetti	**.104**	**.023**	**.338**
Adjusted R Squared .069			
Jam Tart	**1.000**	**1.000**	**1.000**
Adjusted R Squared 1.00			
Digestive Biscuits	**.119**	**.438 *****	**.208**
Adjusted R Squared .485			
Digestive Biscuits (Chocolate)	**.061**	**.320 *****	**.424 ****
Adjusted R Squared .447			
Teacakes	**.473**	**.632**	**.847**
Adjusted R Squared .683			
Beef (Topside)			
Adjusted R Squared			
Beef (Mince)	**.222**	**.057**	**.740**
Adjusted R Squared .307			
Bacon	**.237**	**.255 ***	**.412**
Adjusted R Squared .268			
Chicken			
Adjusted R Squared			
Sausages	**.265 ***	**.129**	**.501 ****
Adjusted R Squared .614			
Beefburgers	**.147**	**.905 *****	**.368**
Adjusted R Squared .897			
Cod Fillets			
Adjusted R Squared			
Tuna	**.021**	**.613 *****	**.266**
Adjusted R Squared .613			
Fish Fingers	**.308**	**.687 ****	**.837**
Adjusted R Squared .657			
Butter	**.086**	**.083**	**.257**
Adjusted R Squared .103			
Margarine	**.070**	**.019**	**.122**
Adjusted R Squared -.188			
Vegetable Oil	**.148**	**.011**	**.416**
Adjusted R Squared .125			
Full Milk	**.070**	**.155 ****	**.258**
Adjusted R Squared .183			
Skimmed Milk	**.070**	**.144 ****	**.221**
Adjusted R Squared .151			

Yoghurt			
Adjusted R Squared			
Cheese	**.085**	**.289 ****	**.336**
Adjusted R Squared .380			
Eggs	**.370 *****	**.245 ***	**.619 *****
Adjusted R Squared .742			
New Potatoes	**.024**	**.215**	**.254**
Adjusted R Squared -.570			
Old Potatoes	**.075**	**.273 ***	**.666 *****
Adjusted R Squared .480			
Frozen Chips	**.000**	**.000**	**.633**
Adjusted R Squared .743			
Cabbage	**.840**	**.719**	**.972**
Adjusted R Squared .878			
Lettuce	**.142**	**.087**	**.590**
Adjusted R Squared .120			
Carrot	**.288**	**.263**	**.610**
Adjusted R Squared .440			
Cucumber	**.315**	**.540 ****	**.638**
Adjusted R Squared .682			
Tomatoes	**.105**	**.203**	**.488 ***
Adjusted R Squared .243			
Onions	**.287**	**.279 ***	**.626 ****
Adjusted R Squared .486			
Baked Beans	**.133**	**.023**	**.318**
Adjusted R Squared .110			
Tinned Tomatoes	**.085**	**.280**	**.288**
Adjusted R Squared .225			
Frozen Peas	**-**	**-**	**1.000 *****
Adjusted R Squared 1.00			
Oranges	**.322**	**.603 *****	**.703 *****
Adjusted R Squared .732			
Apples	**.065**	**.158**	**.288**
Adjusted R Squared .220			
Bananas	**.120**	**.297 ***	**.297**
Adjusted R Squared .102			
Sultana's	**.467**	**.444**	**.738**
Adjusted R Squared .234			
Orange Juice	**.200**	**.743 *****	**.225**
Adjusted R Squared .687			
Pears	**.429**	**.876 *****	**.820 ***
Adjusted R Squared .745			
Sugar	**.087**	**.235 ****	**.473 ****
Adjusted R Squared .485			
Jam	**.106**	**.470 *****	**.440**
Adjusted R Squared .449			
Flour	**.154**	**.001**	**.715 ****
Adjusted R Squared .640			
Tea	**.200**	**.208 ***	**.301**
Adjusted R Squared .224			
Coffee	**.165**	**.239 ****	**.244**
Adjusted R Squared .288			
Drinking Chocolate	**-**	**-**	**1.000**
Adjusted R Squared 1.00			
Tomato Soup	**.092**	**.890 *****	**.252**
Adjusted R Squared .884			
Cola	**.089**	**.649 *****	**.224**
Adjusted R Squared .723			
Chocolate	**.155**	**.002**	**.417 *****
Adjusted R Squared .399			

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.9 Results of a series of GLMs on independent variables for brand price of each food item in 'independent stores'.

Food Item (Brand Price)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced) Adjusted R Squared .401	**.203**	**.191 ***	**.479 ***
Wh'meal Loaf (lge sliced) Adjusted R Squared .579	**.150**	**.337 ***	**.748 *****
Wh'meal Loaf (sml sliced) Adjusted R Squared .293	**.169**	**.138**	**.493**
Cornflakes Adjusted R Squared .118	**.021**	**.144**	**.254**
Weetabix Adjusted R Squared .436	**.048**	**.250 ***	**.466**
Dried Spaghetti Adjusted R Squared 1.00	-	-	**1.000**
Tinned Spaghetti Adjusted R Squared .204	**.137**	**.235 *****	**.242**
Digestive Biscuits Adjusted R Squared .157	**.081**	**.114 ****	**.153**
Digestive Biscuits (Chocolate) Adjusted R Squared .439	**.083**	**.114 ****	**.542 *****
Sausages Adjusted R Squared -.522	**.024**	**.003**	**.134**
Beefburgers Adjusted R Squared 1.00	-	-	**1.000**
Tuna Adjusted R Squared -.004	**.032**	**.013**	**.306**
Fish Fingers Adjusted R Squared .764	**.288**	**.757 ****	**.898**
Butter Adjusted R Squared .267	**.120**	**.135**	**.414**
Margarine Adjusted R Squared -.006	**.050**	**.052**	**.212**
Vegetable Oil Adjusted R Squared .481	**.028**	**.542 ***	**.758**
Full Milk Adjusted R Squared .196	**.044**	**.178 ****	**.214**
Skimmed Milk Adjusted R Squared .142	**.047**	**.004**	**.400**
Yoghurt Adjusted R Squared -.116	**.186**	**.258**	**.513**
Cheese Adjusted R Squared .999	**.645**	**.984 ****	**1.000**
Eggs Adjusted R Squared .724	**.333 ****	**.241 ***	**.616 *****
New Potatoes Adjusted R Squared -.582	**.018**	**.194**	**.285**
Old Potatoes Adjusted R Squared .501	**.077**	**.302 ****	**.674 *****
Frozen Chips Adjusted R Squared .743	**.000**	**.000**	**.633**
Cabbage Adjusted R Squared .930	**.919**	**.851**	**.987 ***
Lettuce Adjusted R Squared .003	**.341**	**.039**	**.635**
Carrot Adjusted R Squared .440	**.288**	**.263**	**.610**

Cucumber	**.315**	**.540 ****	**.638**
Adjusted R Squared .682			
Tomatoes	**.124**	**.221**	**.480**
Adjusted R Squared .201			
Onions	**.277**	**.272 ***	**.622 ***
Adjusted R Squared .473			
Baked Beans	**.059**	**.080**	**.405**
Adjusted R Squared .208			
Tinned Tomatoes	**.000**	**.000**	**.929 ***
Adjusted R Squared .925			
Frozen Peas	**.000**	**.000**	**1.000**
Adjusted R Squared 1.00			
Oranges	**.322**	**.603 *****	**.703 *****
Adjusted R Squared .732			
Apples	**.101**	**.130**	**.229**
Adjusted R Squared -.022			
Bananas	**.128**	**.288 ***	**.366**
Adjusted R Squared .127			
Orange Juice	**.519**	**.962 ***	**.919**
Adjusted R Squared .936			
Pears	**.431**	**.879 *****	**.833 ***
Adjusted R Squared .724			
Sugar	**.087**	**.213 ****	**.473 ****
Adjusted R Squared .491			
Jam	**.267**	**.032**	**.549**
Adjusted R Squared .073			
Flour	**.052**	**.015**	**.698 ****
Adjusted R Squared .533			
Tea	**.357**	**.590 ***	**.803**
Adjusted R Squared .878			
Coffee	**.195**	**.442 *****	**.271**
Adjusted R Squared .398			
Drinking Chocolate	**-**	**-**	**1.000**
Adjusted R Squared 1.00			
Tomato Soup	**.077**	**.172 *****	**.280**
Adjusted R Squared .161			
Cola	**.087**	**.054**	**.252**
Adjusted R Squared .142			
Chocolate	**.048**	**.013**	**.261**
Adjusted R Squared .159			

(*p< 0.05; **p<0.01; ***p<0.00)

Table 6.10 Results of a series of GLMs on independent variables for the 'price range' of each food item in 'independent stores'.

Food Item (Price Range)	Independent Variables (Eta Sq & Significance)		
	Postcode Sector DEPCAT	*Shop type*	*Locality*
White Loaf (lge sliced)	**.136**	**.076**	**.138**
Adjusted R Squared .076			
White Loaf (smi unsliced)	**.680**	**.719**	**.808**
Adjusted R Squared .528			
Baps (white)	**.052**	**.114**	**.152**
Adjusted R Squared -.169			
Wh'meal Loaf (lge sliced)	**.130**	**.132**	**.415**
Adjusted R Squared .328			
Wh'meal Loaf (sml sliced)			
Adjusted R Squared			
Cornflakes	**.152**	**.056**	**.372**
Adjusted R Squared .114			
Weetabix	**.010**	**.104**	**.473 ***
Adjusted R Squared .289			
Dried Spaghetti	**.256**	**.909 *****	**.711 *****
Adjusted R Squared .920			
Tinned Spaghetti	**.044**	**.082**	**.252**
Adjusted R Squared .162			
Jam Tart			
Adjusted R Squared			
Digestive Biscuits	**.113**	**.707 *****	**.236**
Adjusted R Squared .696			
Digestive Biscuits (Chocolate)	**.024**	**.354 *****	**.161**
Adjusted R Squared .314			
Teacakes			
Adjusted R Squared			
Beef (Topside)	**.057**	**.000**	**.955 ***
Adjusted R Squared .866			
Beef (Mince)	**.022**	**.008**	**.679**
Adjusted R Squared .196			
Bacon	**.879 *****	**.220**	**.925 *****
Adjusted R Squared .903			
Chicken			
Adjusted R Squared			
Sausages	**.104**	**.286 ****	**.580 *****
Adjusted R Squared .627			
Beefburgers	**.055**	**.307 ***	**.431**
Adjusted R Squared .422			
Cod Fillets			
Adjusted R Squared			
Tuna	**.037**	**.439 *****	**.277**
Adjusted R Squared .400			
Fish Fingers	**.417**	**.340**	**.711**
Adjusted R Squared .082			
Butter	**.083**	**.016**	**.228**
Adjusted R Squared -.043			
Margarine	**.089**	**.004**	**.223**
Adjusted R Squared -.029			
Vegetable Oil	**.178**	**.003**	**.413**
Adjusted R Squared -.024			
Full Milk	**.045**	**.017**	**.140**
Adjusted R Squared -.065			
Skimmed Milk	**.030**	**.018**	**.119**
Adjusted R Squared -.098			

Yoghurt	**.177**	**.334**	**.411**
Adjusted R Squared .193			
Cheese	**.107**	**.649 *****	**.218**
Adjusted R Squared .637			
Eggs	**.185**	**.135**	**.038**
Adjusted R Squared .077			
New Potatoes			
Adjusted R Squared			
Old Potatoes	**.246**	**.543 *****	**.354**
Adjusted R Squared .632			
Frozen Chips			
Adjusted R Squared			
Cabbage	**.714**	**.976 *****	**.931**
Adjusted R Squared .935			
Lettuce	**.037**	**.082**	**.602**
Adjusted R Squared .088			
Carrot			
Adjusted R Squared			
Cucumber			
Adjusted R Squared			
Tomatoes	**.277**	**.364 ****	**.743 *****
Adjusted R Squared .710			
Onions			
Adjusted R Squared			
Baked Beans	**.156**	**.012**	**.309**
Adjusted R Squared .103			
Tinned Tomatoes	**.324**	**.465 ****	**.758 *****
Adjusted R Squared .639			
Frozen Peas			
Adjusted R Squared			
Oranges			
Adjusted R Squared			
Apples	**.118**	**.430 *****	**.569 ****
Adjusted R Squared .636			
Bananas			
Adjusted R Squared			
Sultana's			
Adjusted R Squared			
Orange Juice	**.506 *****	**.047**	**.285**
Adjusted R Squared .449			
Pears	**.115**	**.835 *****	**.409**
Adjusted R Squared .769			
Sugar	**.064**	**.039**	**.284**
Adjusted R Squared -.257			
Jam			
Adjusted R Squared			
Flour	**.409 ***	**.002**	**.414**
Adjusted R Squared .201			
Tea	**.238**	**.164**	**.289**
Adjusted R Squared .206			
Coffee	**.134**	**.094**	**.220**
Adjusted R Squared .028			
Drinking Chocolate			
Adjusted R Squared			
Tomato Soup	**.069**	**.795 *****	**.163**
Adjusted R Squared .775			
Cola	**.081**	**.650 *****	**.223**
Adjusted R Squared .745			
Chocolate	**.072**	**.029**	**.515 *****
Adjusted R Squared .402			

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.10 shows results for a series of GLM models for price range in independent stores. Again locality has the most number of highest Eta Sq values, twenty-nine of forty-one items yielding the highest results in this analysis compared to shop type and postcode sector DEPCAT, with nine of the twenty-nine items reaching significance. Again shop type, though not dominating as in previous analyses, does make a strong showing. A stronger statistical relationship is found for Eta Sq values for shop type than locality in 12 out of 41 food items. Three other food items reach significance for shop type (sausages, tomatoes and tinned tomatoes) but they are less statistically significant than locality. The magnitude of Eta Sq is also smaller. Postcode Sector DEPCAT also returns high Eta Sq values, with significance at $p<0.001$ for Bacon and Orange Juice but is relatively unimportant in most other cases. The adjusted r squared values range from -0.257 (sugar) to 0.920 (dried spaghetti) with negative values being recorded for baps, butter, margarine, vegetable oil, full milk, skimmed milk and sugar. A wide variation in Eta Sq values were recorded for all the independent variables in the analysis but particularly wide variations between variables were recorded for Dried Spaghetti, Digestive Biscuits, Bacon, Cabbage, Tomatoes, Tinned Tomatoes, Pears and Tomato Soup.

In addition to describing the main effects in these GLM models it might have been appropriate to test formally for interactions. An interaction is when the effect of one variable is not the same under all the conditions of the other variable (Bryman & Cramer 1997). For example an interaction might occur if a specific type of shop is associated with food price in a less affluent neighbourhood, but not in a more affluent neighbourhood. However the existence of such a large main effect of shop makes it unlikely that there will be any interactions between the independent variables. Also some shop types are less likely to be found in more affluent places compared to less affluent places or vice versa e.g. few discounters in rich areas or delicatessens in poor areas. It is thus inappropriate to test for interactions between shop types and deprivation as in some cases the numbers will be very small (e.g. discounters in rich areas) thus rendering results inconclusive.

Summary

Table 6.11 below summarises the preceding section. This table shows the relative importance of each dependent variable for Eta Sq values and Significance for each

independent variable in the analysis. For example for mean lowest price in all shops we can see that 'shop type' is the most important variable in explaining variation as 50 of the 56 food items show 'shop type' having the largest Eta Sq value. Similarly we can also see that for 'shop type' 50 of those 56 items in the analysis reach statistical significance.

What this table shows is that the type of shop in which food is purchased is more important than location or area deprivation at the postcode sector level for this analysis. This is true for most of the independent variables tested with the exception of the food price variables in the 'independent' shops sub-sample. The results for those variables indicate that when multiples are excluded from the analysis (i.e.when just independent stores are analysed) locality becomes more important in accounting for variations in lowest price, brand price and price range. This shows the importance of food superstores in determining price in the local area. However there is a caveat - fewer significant results are returned for locality than shop type in independent stores.

Table 6.11 Summary of results obtained in Chapter 6.3.1

	Postcode Sector DEPCAT		Shop Type		Locality	
	Eta Sq	*Sig*	*Eta Sq*	*Sig*	*Eta Sq*	*Sig*
All shops						
Mean lowest price	-	3/56	50/56	50/56	6/56	10/56
Mean Brand price	-	1/47	38/47	41/47	9/47	14/47
Mean price range	-	6/49	43/49	44/49	9/49	6/49
Multiple Store						
Mean lowest price	-	6/53	34/53	41/53	19/53	6/53
Mean Brand price	3/53	3/53	27/53	30/53	13/53	2/53
Mean price range	-	1/44	32/44	40/44	12/44	1/44
Independent Stores						
Mean lowest price	-	4/53	12/53	27/53	41/53	13/53
Mean Brand price	-	1/47	3/47	22/47	44/47	12/47
Mean price range	2/41	3/41	10/41	15/41	29/41	9/41

Eta Sq = Nos of food items with highest Eta Sq values
Sig = Nos of food items which have significant Eta Sq values

6.3.2 Explaining variations in food availability - results

This section deals with explaining variations in food availability in all shops within the study sample. Logistic regression was used rather than GLM (which was used in the previous section investigating food price) because measures of food availability and DEPCAT (the dependent variable) are categorical in nature and thus logistic regression is appropriate for this analysis. In this set of analyses we used two independent variables, postcode sector DEPCAT and shop type, to try and explain food availability. In the GLM models we included health board locality as an independent variable because we had found some significant bivariate associations between food price and locality (chapter 5.1.1). Since bivariate analyses showed few significant bivariate associations between availability and locality (chapter 5.2) locality was not entered into the logistic regression. Measures of food availability were recorded using a dichotomous variable (available/unavailable) with those classed as missing[1] being discarded from the analysis. In this section only data from the complete sample is used – we have not divided the data-set into two sub-samples of 'multiple' and independent' stores as in preceding sections. Analysing them separately would report erroneous results. For example fruit and vegetable availability would be heavily biased by the presence of fruit and vegetable shops in the independent stores sub-sample, and for multiple-owned outlets most food items (though not always certain food brands) in the survey are nearly always available (barring some seasonal variation). Therefore in this section we sought to discover, after controlling for shop type, how far deprivation (as measured by DEPCAT) predicts food availability.

The following tables summarise a set of logistic regressions for individual food item availability with each independent variable being added to the model cumulatively. Availability is measured in three different ways; general availability, branded item availability (to control for quality), and availability in a specified weight/size. Thus the rows in the tables show, for each individual food item, the Nagelkerke R^2 statistic which describes proportion of deviance explained and the level of statistical significance for DEPCAT for each of the two models (see table 6.12). The two independent variables in the model are used to show how important, after entering each confounding variable progressively, DEPCAT is in determining food availability. The proportion of deviance

[1] Items classed as missing are defined as those foods not expected to appear in certain individual shops i.e. fish in a fruit and vegetable store or bread in butchers.

explained can be used to show how well each model fits the data and refers to the change in likelihood or goodness of fit, when each block of independent variables has been controlled for (Norusis, 1993). In other words how much of the deviance can be explained by the variables entered into the analysis. Displaying the level of significance for DEPCAT can give us an indication of how statistically significant DEPCAT is in predicting food availability after we have controlled for shop type. DEPCAT category 7 and multiple 'shop-type' were used as the reference categories in this analysis. The key to tables of the results is shown below (table 6.12).

Table 6.12 Key to models used in the logistic regression analysis

Model	Independent variables in each model
1	Postcode Sector DEPCAT (a 7-fold measure of area deprivation with7 - least affluent - used as reference category)
2	1 + Shop Type (a 10-fold measure of shop type with 1-multiple store – used as reference category)

Table 6.13 shows the results of a series of logistic regressions for general food availability. The table shows that DEPCAT explains very little of the deviance in food availability but the addition of shop type to the model substantially increases the proportion of deviance explained for all food. DEPCAT and shop type combined can explain up to 90.6% of the deviance (Weetabix) with the majority of food items having between 40 - 60% of the deviance explained by these two variables. Statistical significance is not reached when DEPCAT is entered in the model, when both DEPCAT and shop type are considered, again no significant results are found. Neither postcode sector DEPCAT, nor shop type, nor both together are significant predictors of whether or not a food item is available.

Table 6.14 reports the results of a series of logistic regressions for branded food item availability. The table shows that, again, DEPCAT on it's own accounts for a relatively small amount of the deviance – a maximum of 13.7% (for jam tarts). When shop type is added to the model we can see that for all branded food items the proportion of deviance explained increases dramatically. DEPCAT & shop type can account for up to 79.3% (Class 1 Cabbage) of the deviance explained. However statistical significance is not reached for Model 1 and only once for Model 2 (coca-cola).

Table 6.15 displays the results of a series of logistic regressions for food availability in specified weight/size in all shops. DEPCAT accounts for very little of the proportion of deviance explained (a maximum of 11.2% for tomato soup).The addition of shop type to the model increases the amount of deviance explained. Conventional levels of significance are not reached in either of the two models explored.

Table 6.13 Results of a series of logistic regressions of independent variables for general food availability in all shops

Food Item	(1) Postcode Sector DEPCAT		(2) 1 + Shop type	
	prop of deviance explained	*Significance* (DEPCAT)	*prop of deviance explained*	*Significance* (DEPCAT)
White Loaf (lge sliced)	.078	.6328	.331	.8380
White Loaf (sml unsliced)	.036	.5840	.688	.8762
Baps (white)	.058	.1933	.328	.3335
Wh'meal Loaf (lge sliced)	.073	.2186	.377	.3896
Wh'meal Loaf (sml sliced)	.044	.3910	.507	.5559
Cornflakes	.061	.3103	.452	.4757
Weetabix	.064	.2121	.516	.1872
Dried Spaghetti	.046	.4908	.599	.7360
Tinned Spaghetti	.024	.9191	.471	.9979
Jam Tart	.075	.1707	.328	.6760
Digestive Biscuits	.070	.2983	.406	.6595
Digestive Biscuits (Chocolate)	.066	.3210	.344	.4784
Teacakes	.087	.4541	.254	.5228
Beef (Topside)	.040	.4233	.731	.7555
Beef (Mince)	.046	.3176	.885	.8988
Bacon	.063	.1787	.616	.8394
Chicken	.059	.2369	.906	.9587
Sausages	0.56	.3888	.604	.7512
Beefburgers	.047	.3371	.594	.4824
Cod Fillets	.045	.5805	.774	.9532
Tuna	.028	.8107	.360	.7580
Fish Fingers	.061	.2696	.757	.2424
Butter	.036	.6996	.429	.9490
Margarine	.054	.3920	.457	.6788
Vegetable Oil	.021	.8390	.554	.7364
Full Milk	.096	.9444	.362	.7330

Skimmed Milk	.096	.9444	.362	.7330
Yoghurt	.046	.4543	.690	.4459
Cheese	.054	.4016	.450	.7058
Eggs	.014	.9060	.498	.9479
New Potatoes	.051	.2981	.753	.1362
Old Potatoes	.034	.5252	.542	.7305
Frozen Chips	.044	.4368	.815	.6421
Cabbage	.018	.8038	.798	.6418
Lettuce	.027	.6685	.773	.5222
Carrot	.028	.6798	.719	.6993
Cucumber	.039	.4209	.776	.1733
Tomatoes	.030	.6285	.669	.5372
Onions	.033	.5701	.667	.4708
Baked Beans	.050	.5007	.352	.5380
Tinned Tomatoes	.065	.2241	.610	.4790
Frozen Peas	.035	.5734	.818	.6777
Oranges	.057	.3963	.575	.4610
Apples	.051	.4475	.633	.4957
Bananas	.047	.3157	.676	.2094
Sultana's	.050	.3311	.662	.8693
Orange Juice	.064	.3709	.601	.6289
Pears	.024	.7233	.769	.9021
Sugar	.017	.9807	.351	.9524
Jam	.072	.1465	.471	.1363
Flour	.019	.8577	.502	.8608
Tea	.064	.4032	.464	.3651
Coffee	.032	.8514	.326	.9715
Drinking Chocolate	.029	.6859	.796	.3451
Tomato Soup	.112	.5151	.329	.6331
Cola	.097	.2628	.412	.1192
Chocolate	.076	.4760	.367	.8150

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.14 Results of a series of logistic regressions of independent variables for branded food availability in all shops

Food Item	(1) Postcode Sector DEPCAT		(2) 1 + Shop type	
	prop of deviance explained	*Significance* (DEPCAT)	*prop of deviance explained*	*Significance* (DEPCAT)
White Loaf (lge sliced)	.021	.8054	.201	.9009
Wh'meal Loaf (lge sliced)	.035	.5374	.385	.7143
Wh'meal Loaf (sml sliced)	.052	.3672	.546	.4329
Cornflakes	.025	.7665	.430	.9111
Weetabix	.038	.5482	.493	.7618
Dried Spaghetti	.020	.8734	.409	.9981
Tinned Spaghetti	.031	.8339	.427	.9862
Jam Tart	.137	.7665	.257	.9387
Digestive Biscuits	.064	.2855	.446	.5194
Digestive Biscuits (Chocolate)	.054	.3657	.227	.4786
Teacakes				
Bacon	.057	.9711	.403	.6590
Sausages	.093	.9312	.401	.8721
Beefburgers	.045	.3693	.570	.5139
Tuna	.018	.9134	.291	.8644
Fish Fingers	.091	.1124	.540	.2658
Butter	.033	.6339	.459	.6293
Margarine	.030	.7072	.383	.7754
Vegetable Oil	.021	.8265	.771	.3675
Full Milk	.028	.8823	.624	.7472
Skimmed Milk	.044	.9523	.241	.9325
Yoghurt	.099	.6313	.438	.6180
Cheese	.033	.6100	.746	.7022
Eggs	.011	.9391	.487	.4354
New Potatoes	.050	.3046	.749	.1401
Old Potatoes	.034	.5252	.542	.7305

Frozen Chips	.081	.1178	.623	.2218
Cabbage	.018	.8082	.793	.6694
Lettuce	.021	.7961	.775	.6962
Carrot	.028	.6798	.719	.6993
Cucumber	.039	.4209	.776	.1733
Tomatoes	.030	.6217	.677	.5411
Onions	.038	.4712	.676	.4455
Baked Beans	.048	.4771	.233	.5581
Tinned Tomatoes	.074	.1933	.785	.4690
Frozen Peas	.046	.3993	.755	.9859
Oranges	.057	.3963	.575	.4610
Apples	.041	.6980	.667	.5942
Bananas	.036	.5127	.704	.3692
Sultana's	.113	.3317	.592	.5145
Orange Juice	.049	.2934	.607	.7395
Pears	.019	.8177	.783	.9082
Sugar	.030	.8542	.326	.9690
Jam	.053	.5573	.366	.2953
Flour	.027	.7628	.281	.8416
Tea	.024	.7790	.561	.8070
Coffee	.053	.5417	.246	.8601
Drinking Chocolate	.026	.7690	.521	.7680
Tomato Soup	.083	.4944	.286	.7575
Cola	.126	.0968	.651	.0384
Chocolate	.076	.2172	.285	.3714

(*p< 0.05; **p<0.01; ***p<0.001)

Table 6.15 Results of a series of logistic regressions of independent variables for food availability in a specified weight/size in all shops

Food Item	(1) Postcode Sector DEPCAT		(2) 1 + Shop type	
	prop of deviance explained	*Significance* (DEPCAT)	*prop of deviance explained*	*Significance* (DEPCAT)
White Loaf (lge sliced)	.078	.6328	.331	.8380
White Loaf (sml unsliced)	.036	.5840	.688	.8762
Baps (white)	.064	.1443	.343	.2557
Wh'meal Loaf (lge sliced)	.073	.2186	.377	.3896
Wh'meal Loaf (sml sliced)	.044	.3910	.507	.5559
Cornflakes	.061	.3103	.452	.4757
Weetabix	.063	.2204	.533	.1538
Dried Spaghetti	.046	.4948	.614	.6824
Tinned Spaghetti	.024	.9191	.471	.9979
Jam Tart	.070	.2077	.330	.6760
Digestive Biscuits	.072	.2144	.425	.6523
Digestive Biscuits (Chocolate)	.067	.2441	.352	.3307
Teacakes	.087	.4541	.254	.5228
Beef (Topside)	.040	.4233	.731	.7555
Beef (Mince)	.046	.3176	.885	.8988
Bacon	.063	.1787	.616	.8394
Chicken	.059	.2369	.906	.9587
Sausages	.056	.3888	.604	.7512
Beefburgers	.047	.3371	.594	.4824
Cod Fillets	.045	.5805	.774	.9532
Tuna	.028	.8107	.360	.7580
Fish Fingers	.061	.2696	.757	.2424
Butter	.036	.6996	.429	.9490
Margarine	.054	.3920	.457	.6788
Vegetable Oil	.019	.8670	.546	.7745
Full Milk	.096	.9444	.362	.7330

Skimmed Milk	.096	.9444	.362	.7330
Yoghurt	.046	.4543	.690	.4459
Cheese	.054	.4016	.450	.7058
Eggs	.014	.9060	.498	.9479
New Potatoes	.051	.2981	.753	.1362
Old Potatoes	.034	.5252	.542	.7305
Frozen Chips	.044	.4368	.815	.6421
Cabbage	.018	.8038	.798	.6418
Lettuce	.027	.6685	.773	.5222
Carrot	.028	.6798	.719	.6993
Cucumber	.039	.4209	.776	.1733
Tomatoes	.030	.6285	.669	.5372
Onions	.033	.5701	.667	.4708
Baked Beans	.050	.5007	.352	.5380
Tinned Tomatoes	.065	.2241	.610	.4790
Frozen Peas	.035	.5734	.818	.6777
Oranges	.055	.4477	.602	.4487
Apples	.047	.5203	.634	.4816
Bananas	.047	.3157	.676	.2094
Sultana's	.054	.2835	.690	.8751
Orange Juice	.064	.3709	.601	.6289
Pears	.023	.7559	.768	.9060
Sugar	.020	.9627	.366	.9837
Jam	.062	.2113	.561	.1511
Flour	.019	.8614	.491	.8630
Tea	.049	.5483	.471	.3683
Coffee	.032	.8514	.326	.9715
Drinking Chocolate	.037	.5339	.673	.8457
Tomato Soup	.112	.5151	.329	.6331
Cola	.051	.2421	.422	.1214
Chocolate	.089	.1046	.851	.0761

(*p< 0.05; **p<0.01; ***p<0.001)

In summary this chapter shows that, unequivocally, shop type is the most important predictor in determining the price and availability of food in the study sample. In only one sub-sample, for price variation in independent stores (tables 6.8 – 6.10), is any other independent variable more important (in that instance locality). Unsurprisingly the type of shop in which food is sold predicts food availability. What is surprising however, is the finding that level of deprivation as measured by DEPCAT does not predict food availability. In some regression models the reason for a lack of an expected effect can be due to the other variables in the model acting as a suppresser – this only occurs when the variables in question could conceivably be directly related. It could be argued that as multiple retailing maybe an indicator of inward investment within an area and that the lack of a multiple-owned retail outlet is a signifier of deprivation. However we would not expect every neighbourhood (affluent or deprived) to have a multiple-owned store within it's environs, therefore in this case the lack of a deprivation effect for food availability cannot be due to shop type acting as a suppresser variable for area deprivation as they are not **directly** related.

The next chapter will discuss these results found in this and preceding chapters in terms of the wider literature on the price and availability of food in urban areas.

Chapter 7: Conclusions

Many recent policy documents (Scottish Office 1993, SEU 1998, DoH 1999) suggest or assert that 'food deserts' (urban areas with little or no food retail provision), and the high price of food in poorer areas, can contribute to inequalities in access to healthy food. This inequality in food access can contribute to inequalities in health through diet-related health risks such as obesity, cerebrovascular disease, dental caries and certain cancers and thus eventually to higher rates of morbidity and mortality in these more deprived areas where food access is limited. However it seems that there is little systematic empirical evidence about spatial variations, either in food availability (in terms of location of stores or food stocking policy) or food pricing, to support these assertions. Evidence seems to be limited to a few anecdotal or grey literature documents reporting food deserts and price inequity (Welsh Consumer Council 1990, Burrows et al 1991, Edinburgh Community Food Initiative 1999) and a few small scale studies of food price and availability (Mooney 1990, Sooman et al 1993, Piachaud & Webb 1996, Barratt 1997). This thesis therefore attempted to generate more systematic empirical evidence than was currently available about intra-urban spatial variations in food price and availability. Three issues were investigated: the location of food shops and their type; the availability (available at all, branded item availability and available in a specified weight/size) of a pre-defined range of foodstuffs in those shops; and the price (lowest price, branded price and price range) of a pre-defined range of foodstuffs in these shops. This pre-defined range of foodstuffs was drawn from the Family Budget Unit's (1993) definition of a 'modest but adequate' diet and consisted of 57 standard food items (see Chapter 2.3.2).

Four main research questions were addressed: are there spatial variations in food retail provision in urban areas of the UK, does the price and availability of food vary by type of shop in urban areas, are there differences in food price and availability by more or less affluent area, and finally, which is the strongest predictor of food price and availability, shop location, shop type or magnitude of area level of deprivation? This last question is answered in Chapter 6 and presents the results of multivariate analyses which show that shop type is the most important predictor in determining the price and availability of food within the study sample. Formally, the null hypothesis tested was as

follows: There is no spatial variation in food price and availability, and it is not related to social deprivation. On the basis of the empirical data collected in this study there is no reason to reject this null hypothesis. Current policy, based upon assertions that food deserts are present in poor areas or that food is more expensive and less available in poor areas may not be empirically substantiated. The answers to the questions outlined above will now be presented in relation to current debates within the literature.

7.1 Are there spatial inequities in food retail provision in the study sample?

The existing evidence for spatial variations in food retail provision at the time that this thesis was undertaken has been covered in Chapters 1 and 3. They summarise a number of points concerning the changing nature of the food retail economy in the late 1980s and the early 1990s as well as outlining evidence for the uneven distribution of food retail outlets in urban areas of the UK and elsewhere. A number of points emerged from this literature. The total number of food retail outlets in the UK has been declining dramatically primarily due to the closure of smaller independent stores, a trend that started in the 1970's. This coincided with the rise in power of the larger multiple-owned retail groups such as Tesco plc, Safeway plc & Sainsburys' plc. The concentration of British food retail capital by these multiple groups through merger and acquisition was one of the defining characteristics of the food retail system during the 1980s.

Coinciding with this concentration of retail capital there was also a major retailer-led reorganisation of the supply chain that substantially reduced the amount of capital tied up in stock. This allowed multiple companies to achieve huge economies of scale, which enabled them to slash costs, and hence prices on the shop floor while maintaining their profitability. Economies of scale were enhanced by multiple stores relocating out of their traditional town centre locations onto edge or out-of-town sites, or onto purpose built retail parks capable of delivering the organisational economies of scale required by these multiple retailers. According to some commentators this had a significant effect on the accessibility of shopping facilities to different groups of consumers and had allowed spatial inequities in the distribution of food retail outlets in some urban areas to develop. Materially deprived neighbourhoods in major cities were found to have fewer multiple owned superstores and fewer general food stores than more affluent neighbourhoods.

What happens when we investigate the geographical distribution of food retail formats in Glasgow? Is there equal access to food retail outlets across the city? Taking into account possible data reporting problems from the local council in Strathkelvin, the answer is generally yes. We can see that food stores tend to be sited in more highly populated areas (figure 3.1) and more deprived areas (figure 3.2) though these relationships, though statistically significant, are weak. There were shops in almost all postcode sectors within the Greater Glasgow Health Board (GGHB) area, however there were lower densities of outlets in the south and east of the GGHB area. When we look at the number of shops (by format) by Health Board localities (table 3.6) we can see that most areas have access to a range of shop types. Although there are differences in absolute numbers of shops between localities these differences do not reach statistical significance nor do they have a strong association. In common with much of the retailing literature I found a higher concentration of food retail outlets in the urban centre – an area that is the most accessible by private and public transport.

One of the most common criticisms of modern food retailers is that the price and food choice benefits offered by larger multiple-owned retail formats are simply not available to those who live in poor areas. From this study we can see that these areas do quite well in terms of multiple shopping opportunities (figure 3.3). When we look at the locations of multiple store formats the highly urbanised (in terms of population density) areas of Glasgow show the highest density of these retailers (figure 3.4). Again these are weak, but statistically significant, associations. Both these sets of findings point to a distribution of stores in the more densely populated urban areas, surrounded by slightly less well served outlying areas. When we focus on the numbers of shops in the study sample by DEPCAT (table 3.7), there are more outlets in the most deprived areas at the postcode sector level however this does not reach statistical significance nor is there a strong association. Within this representative sample independent grocers are chiefly responsible for increasing the total number of food stores in poor neighbourhoods (Cummins & Macintyre, 1999).

7.2 Does the price and availability of food vary by shop type in the study sample?

There is a scant literature on the price and availability of food and how it varies by the type of shop. As Chapters 1, 3 and 4 have outlined, most research findings are based

upon local case studies. In general, studies have found that large multiple owned stores such as Tesco plc and Safeway plc are cheaper and have a greater range of food on offer. Conversely smaller, independent, stores such as corner and convenience stores, as well as affiliated independents, tend to have a smaller range of items and also tend to be more expensive. Systematic research on price and availability differences between store types (such as discounters, greengrocers, fishmongers etc) is virtually non-existent. Much of this information is collected in-house by large commercial food companies and is deemed to be highly sensitive for commercial reasons, and thus is not readily available. The few studies which compare food prices between some shop types (see Piachaud & Webb 1996) tend to show that smaller independent stores are more expensive, and have a smaller range of food items on offer, than the larger multiple-owned food retail companies.

This study found that discounters were generally the cheapest (in terms of the food items studied here) for 'lowest priced' foods and 'branded' food items and that delicatessens and independent grocers were the most expensive. This is an unsurprising finding. Discount operators, by their very nature, carry smaller product ranges, invest less in stores, have greater ranges of little known brands and products, and have lower profit margins which enable them to sell at lower prices but achieve greater returns on capital expenditure (ROCE). The largest price ranges, for the majority of foods in the study sample, were recorded for multiples. The shops with the smallest range of prices were independent grocers and freezer stores. This again is unsurprising. Small stores are usually individually owned and are subject to the physical and economic limitations of their size. These constraints limit the amount of stock that can be held by the retailer and hence very limited price economies can be passed onto the consumer due to the inability of the shop owner to bulk purchase. Small independent food stores also have a very small, local, market share (unless they specialise in upmarket products) which does not allow them, for financial reasons, to experiment with different product lines. These small food stores (with the exception of symbol groups such as Spar & Londis) do not enjoy the economies of scale employed by the larger multiple owned food retailers who use these economies to promote a highly competitive pricing structures gained through their ability to negotiate bulk orders of a particular product direct from the manufacturer.

For food availability it was found, as expected, that 'large stores' (multiples, discounter and freezer stores) had a greater range of the selected items for sale at any one time than 'small stores'. For branded food items a greater number of 'small stores' stocked all the items in our 'modest but adequate diet' than 'large stores', though in both cases the total numbers of large and small stores which when visited, stocked all the surveyed branded food items, was fairly low. This finding was unexpected but may be due, in part, to exclusive agreements between certain multiple store operators and the food manufacturing companies who supply those organisations. It may also be that the manufacturer brands were not perceived to be important by the multiple operators and were thus 'de-selected' to make way for retailer branded goods, reflecting a lack of space or desire for multiple-owned retailers to stock manufacturer brands. Smaller, independent operators may use general food wholesalers where this restriction does not apply.

7.3 Are there differences in food price and availability by more or less affluent areas?

A number of studies have found that foods recommended in dietary guidelines may be more expensive and less readily available in more deprived areas. The evidence for this assertion has been outlined in Chapters 1 & 5. The results presented here can be found in more detail in Chapters 5 & 6. Foods regarded as healthy have been reported to be more expensive and less available in poor areas than their unhealthy alternatives (Mooney 1990, Burrows 1991) and a general range of food has also been found to be more expensive and less available in poorer neighbourhoods when compared to more affluent neighbourhoods (Sooman et al 1993).

The results obtained in this study show that in all the surveyed shops, few food items show statistically significant differences in price between more or less affluent areas. In those that do, the majority are cheaper in poorer health board localities, postcode districts and postcode sectors. The one exception is branded food items at the postcode sector level; only 3 of 10 food items with a significant difference in price are cheaper in poorer areas. In the independent stores sub-sample we find a similar set of results. Of the analyses undertaken at locality, postcode district and postcode sector level the statistically significant results were that food was more likely to be cheaper or have a greater price range in the more deprived areas though the magnitude of these differences

was relatively small. Exceptions to this were price range at the locality level, and brand price at the postcode district level.

The food availability data for the whole sample (all shops) shows that for the majority of the three variables analysed (available at all, branded item availability, availability in a specified weight/size) at the majority of the three geographical scales (locality, postcode district, postcode sector) those foods which had statistically significant differences in availability were found to be relatively less available in more deprived areas. The few exceptions were branded food items at the locality level and all three food availability variables (available, branded item availability, availability in a specified weight/size) at the postcode district level. In the independent stores sub-sample branded food items, at all three geographical scales, were found to be relatively more available in more deprived areas.

One general point can be made here. In general those food items which were found to be relatively more available in poorer areas tended to be those food items which health educators recommend reduced consumption of. This coupled, with a finding that some of the same food items in the sample were found to be relatively cheaper in less affluent areas, could create a double incentive to consume those products – these foods being cheaper and more available in more deprived areas.

The results from this study show that there is no completely unambiguous pattern for both food price and availability. However food price taken in isolation does produce results that are contrary to much previously published work. Food items in this survey show no differences in price, or are generally relatively cheaper in more deprived places, compared to more affluent ones. Why should this be the case? It is possible that changes in the food retail economy since the retail exodus from central and neighbourhood areas in the 1980s have prompted a return to central urban areas, the high-street and to neighbourhoods – to fill the 'locational' gap in the local food retail economy (Wrigley, 1998b). This may be due in part to increased competition, changing consumer demands and increased operational efficiency in the retail sector. Thus it could be suggested that the lack of traditionally profitable superstore trading sites has forced large food retailers to reassess areas previously viewed as undesirable, as consumer tastes and demands change. The location of multiple owned outlets -

especially discount-orientated stores such as Aldi, Lidl and Netto - in previously overlooked neighbourhoods (usually those that are classed as deprived) would have the effect of pushing down average food prices in those places. If a large number of discount food operators were sited in such areas then it could certainly be conceivable that local food prices would become, on average, more equal to or less expensive than those in surrounding areas.

The food availability data presented in this section of the thesis (see Chapter 6) is more ambiguous. When considering food items which were significantly different in price there was no clear pattern of availability. The majority of food items were not statistically significantly different between more or less affluent areas in terms of food availability. Previously reported results of poor food availability of deprived areas may now be outdated for reasons similar to those outlined above.

7.4 Which is the strongest predictor of food price and availability - shop location, shop type or area level of deprivation?

General Linear Modelling (GLM) and Logistic Regression were used in order to try and discover which of three variables (shop location, shop type and area level of deprivation) best predicted the price and availability of food in the study sample. For food price (see Chapter 6.3.1 for full results), GLM models show that the type of shop in which food is bought is more predictive than shop location and area level of deprivation at a variety of geographical scales. This was true for most food price variables with the exception of variables in the independent shops sub-sample which indicated that when large superstores were excluded from the analysis (i.e. only independent stores were analysed), health board locality of shop location becomes the most important in determining variation in price. This indicates the importance of food superstores in determining price in local areas.

For food availability (see Chapter 6.3.2 for full results) similar results were found. The type of shop in which food is sold is the most important predictor of availability. It is therefore clear that shop type is the most important determinant of both food price and availability in the context of this study. In only one sub-sample, for price variation in independent stores (tables 6.8 – 6.10), health board locality of shop location is more important – which in the context of supply and demand may be sensible. It may be that

locating in certain health board localities for small shops reflects differences in price due to more or less attractive local business costs or more or less price competition with other food retail businesses in those health board localties. These findings replicate work undertaken elsewhere. Piachaud & Webb (1996) in the UK and Alwitt & Donley (1997) in the USA also found that shop type was important in determining the price and availability of food in urban areas. The number of studies specifically investigating this hypothesis are few – these findings, though plausible, are neither endorsed nor contradicted by any published evidence that we could find.

7.5 The urban foodscape of Glasgow

Though the data presented here are based upon what are a very simple set of statistics they can tell us a great deal about the urban foodscape of Greater Glasgow and what it can mean for the health of its residents. There is very little evidence to suggest an uneven geography of food price and availability across the sample, though some areas classed as semi-rural could be viewed to be at a relative disadvantage. The few foods that are significantly different in price tend to be cheaper in poorer health board localities. However, at the postcode district level those significantly cheaper foods which are sold in independent stores and small grocers tend to be the unhealthier components of the surveyed diet. This has an important implication. Though foods regarded as healthy are not significantly more or less expensive in deprived as opposed to affluent areas, foods that are less healthy (eg sugar, chocolate, cola) generally tend to be less expensive in poorer places. This price incentive may make it more likely that these foods will be consumed in these poorer places, and therefore become a greater part of an individual's everyday diet, which has obvious health implications as these foods tend to be high fat and energy dense. Though nutritionists deny that food is intrinsically unhealthy, and suggest that it is the combination and amount of foods that are eaten in and outside the home that predisposes an individual to suffer from diet-related health problems, it can be argued here that any price incentive to increase consumption of those high fat, energy dense, sugary foods at the expense of relatively more expensive items such as fresh fruit and vegetables is to be discouraged.

Much previous work on the food retail aspects of food poverty has signalled that one of the most common complaints of those living in deprived neighbourhoods is the lack of shopping opportunities (Leather 1996, Killeen 1994, Lang et al 1994). Although it is

clear that shop type is the most important single variable in determining the price and availability of food in Greater Glasgow, the location of food stores in this representative study shows that food outlets are more likely to be sited in more deprived areas of the city. In fact the larger multiple owned food retailers (which include 'hard discounters' such as German operator Lidl) are more likely to be located in poorer Glasgow neighbourhoods than anywhere else in Glasgow, ensuring that the price and availability benefits accruing from these operators, who have fairly wide product ranges, can be accessed by those who live in places traditionally described as having poor access. As outlined above, this may be, in part, an outcome of retail restructuring in the mid-1990's which has heralded the rise of the more compact, convenience style, multiple-owned retail outlets such as Tesco Metro or Sainsburys' Local, and stores with a discount orientation such as Aldi & Lidl. These new stores have returned to central and neighbourhood areas previously thought of as unprofitable. A related reason for these findings may the local strategic planning policies of Glasgow City Council (GCC) at the time of the study. GCC may have purposely targeted central and neighbourhood areas as favoured sites for food retail planning consent. Though in recent years (GCC, 2000) this may be the case, there is no evidence to suggest that this was the case during the mid-1990s.

One surprising finding is the lack of a deprivation effect on the price and availability of food in Glasgow. Though previous research, such as that exemplified by Mooney (1990) is often cited as suggesting that food is more expensive in more deprived areas this was not found to be the case in Glasgow. There is no precedent for this finding in the literature but we can speculate in a number of ways as to why this might be the case.

Firstly, in this study we used a binary division of deprivation in order to analyse food price and availability. Earlier studies undertaken elsewhere which did find a deprivation effect and which used similar methods may have been based upon greater contrasts of deprivation than were found in this study. However Glasgow has long been notorious as one of the poorest places in the UK (Dorling 1997, Shaw et al 1999) and also as one with the greatest contrasts.

Secondly, Glasgow also has a large number of brownfield and derelict sites which are located in more deprived areas. These areas form part of the strategic plan for Glasgow

and development is encouraged on these sites (GCC, 2000). Large multiple-owned supermarkets wishing to keep start-up costs to a minimum may prefer to locate on these sites, some of which have proximity to major transport arteries. This has the effect of having large supermarkets, with the price economies they bring (findings in this thesis indicate that multiple-owned outlets are the cheapest shop type), locating in poorer areas and potentially driving down average prices. This would be reflected in our spatial analysis in a 'smoothing' of price across the study areas.

Finally, we can also speculate on the timing of the studies upon which this thesis draws its basis. Limited-line hard discounters such as Aldi, Lidl and Netto did not exist prior to 1991, thus a number of studies (eg Mooney 1990) which are used as evidence for the existence of 'food-deserts' would probably not show the same results if repeated today. The presence of hard discount retail formats in this study may well account for the discrepancy between this and previous findings.

7.6 Problems with this study

In common with similar studies of this type there are a number of problems associated with this thesis. Firstly the data and results generated in this study may be due to a 'Glasgow' effect – Glasgow may be a unique city and thus any findings may not be generalisable to other urban areas around the UK. A similar study would need to be replicated elsewhere in the UK in order to answer this question. Some preliminary, and as yet unpublished, work from a study of access to healthy food in East London (Dowler & Donkin, personal communication) does however show tentative support at the enumeration district level for the data presented here. Their results show that the higher the enumeration district deprivation level the cheaper the shops ($r=-.2026$, $p=.01$), a finding which held when newsagents and garage forecourts are removed from their statistical analysis ($r=-.1910$, $p=.041$) and thus shows some support for the inverse relationship between food price and area deprivation presented here. Secondly, and relatedly, the data presented here was collected in the summer of 1997 – the food retail sector is very dynamic and thus the findings of this thesis may have changed since then.

A third limitation of this survey is that it is cross-sectional in nature and therefore does not consider how the retail economy may change over the short, medium or long term. As mentioned above, the food-retail economy is very dynamic and a cross-sectional

study though valid may not capture this dynamism. Fourthly this survey, in common with many studies of this nature, can be challenged on whether the foods used in this study are an accurate representation of what Glaswegian people actually eat. To some extent this may be a valid criticism, as the foods in this study are not based upon any specifically Glaswegian diet. For example; Forsyth et al (1994) found that consumption of foods that could be considered part of a wider Glasgow (or Scottish) diet varied little between four socially contrasting neighbourhoods in Glasgow City. However, the foods included in this study are based upon a pre-defined 'basket of foods', the Family Budget Unit's Food Budget Standards for the UK (Nelson et al, 1993). This 'basket-of-foods' is as good as any in current use – being a sensible attempt to quantify the most common food items consumed based upon National Food Survey and Family Expenditure Survey data. There is no such survey tool that could categorise a particularly Glaswegian diet. The study mentioned above did so with the benefit of specialised local knowledge.

A fourth problem outlined here concerns the main unit of analysis in this study - geographical areas - as measured by health board locality, postcode district and postcode sector. When interpreting this sort of spatial data we also need to be aware of a number of issues associated with this sort of analysis, particularly the modifiable areal unit problem. The modifiable areal unit problem (MAUP) is one that is fundamental to almost all spatially aggregated data (though exceptions do exist such as Dorling's (1995) equal population cartograms). MAUP refers to the problem of the sensitivity of analytical results in relation to the definition of units for which data are collected (Openshaw & Alvanides 1998, Fotheringham & Wong 1991, Openshaw 1984). The choice of areas or zones by which to aggregate data (in the context of this thesis either health board locality, postcode district or postcode sector) can dramatically effect the visual interpretation of data and can be an uncontrolled source of variation in cartographic display. In this thesis the maps presented in Chapter 3 have to be used and interpreted with this in mind. However as Openshaw & Alvanides (1998) indicate this problem can be lessened if such variation has to brought under the user's control and visual display is used to illustrate one story that the data can tell, as is the case in this thesis.

The penultimate limitation of this study concerns the large number of univariate and bivariate statistical tests of this type of spatial data and as such must come with a health

warning. Firstly, as Fotheringham & Wong (1991) explain, the modifiable areal unit problem (MAUP) can be extended to this sort of data. Questions can be raised about the reliability of the results reported for the analysis of aggregated spatial data because the results are likely to vary with the level of aggregation (the scale problem) and the configuration of the zoning system used (the zoning problem). As data aggregation increases, by whatever means (ie calculating means or summing data), the process involves a smoothing effect so that the variation of a variable tends to decrease as aggregation increases – leading to lower estimates of correlation coefficients at the highest level of aggregation. However with this in mind it is worth noting that significant differences in food price and availability are reported at all the spatial scales used in this analysis. Secondly as a large number of statistical tests were conducted there will be the chance that some of the statistically significant results reported in this thesis may themselves be due to chance (see chapter 2). Thus there is the possibility that the analysis is subject to Type I error, for example leading us to a false positive conclusion that there is a relationship between deprivation and food price or availability. In order to reduce the probability of a Type I error we can accept a higher level of significance (for example $p<0.01$) as being the benchmark for a statistically significant result (see chapter 2). Even if we assume that there are Type I errors at $p<0.05$ we can see that this is less of a concern in this analysis as most statistically significant results have p values of $p<0.01$. Thus we have allowed for the possibility of Type I error by adopting more stringent levels of statistical significance which in turn makes little difference to the of the results presented in this thesis. In addition to this there remains the question of magnitude of price difference. Some statistically significant results for food price found in this study translate into very small absolute differences in price, in some cases one or two pence only.

One final acknowledgement that needs to be made is that differing access to healthy food, in this thesis, rests on notions of food costs and availability 'in the shop'. We do not have data on local shopping patterns, and we also acknowledge that access to food is multi-dimensional bringing into play individual and household economic resources in addition to physical access issues, which are concentrated on in this thesis.

Despite these methodological caveats, which are common to many studies using spatial or ecological data, or to food basket studies, the results are as robust, if not more so,

than many similar studies. It is worth repeating that this is the largest quantitative survey to date in the UK that looks at intraurban variations in food price and availability.

Suggestions for further research

The limitations to this study as outlined above can lead to several suggestions for further study. There is an obvious need for replication and periodic updating of this sort of study to monitor the resurgence or disappearance of 'food deserts' or spatial variations in food price and availability. It could also be worth investigating where people actually shop. Commercial and official data is available on this topic but it is chiefly concerned with the larger multiple-owned retail outlets: small shops have often been neglected (Smith & Sparks 1997). Having up to date knowledge on how far people range for food shopping and the type of store in which they undertake their main food shopping would be valuable in order to add more depth to this sort of study. There is a limited, though dated, academic literature in this area (see Guy & Wrigley, 1987).

If, as this thesis has suggested, 'food deserts' may not exist in large metropolitan areas of the UK, what other socio-structural explanations are there for persisting socio-spatial inequalities in diet? Investigation into levels of social support, access to transport, stigma and an individual's cultural repertoire and physical ability when cooking and buying food may all be important in determining food consumption patterns. Other areas of interest would be to investigate the distribution and pricing policies of food retailers and manufacturers (large and small) as well as exploring the cost and availability of different meals for varying family types (families with children, older persons living alone, single people etc).

Implications for policy?

Those who work in the food poverty field consistently use the term 'food desert' to describe the on-going lack of food shopping facilities in poor areas and have used it as a convenient and powerful way of attracting the public's attention (Kibby 1998, Laurence 1998, O'Sullivan 1998). However recent policy documents from think tanks such as The Scottish Council Foundation's 'Health Food Policy: On Scotland's Menu? (McCormick, 2000) and the New Policy Institute's 'Food Access – Whose responsibility?' (NPI, 2000) have begun to take a more considered view of the problems

and potential of the food retail economy - the emphasis in these documents is upon what retailers **can** do rather on what they cannot or have not done, or are unwilling to do. What this study points to, therefore, is a call for more robust, systematic measurement of 'food deserts' in terms of spatial variations in food price and availability. There is a need for continued monitoring, at a larger scale of the distribution of shops, food prices and food availability rather than assuming that there are or are not food deserts in British cities. We also need evidence about whether changing retail provision changes food purchase and consumption patterns. The perpetuation of an urban 'myth' that food deserts exist in poor neighbourhoods in the UK needs to be elucidated by close and continued monitoring as outlined above. If policy makers wish to have an evidence-based food policy then they need the evidence to support it.

As mentioned above, other issues such as levels of social support for vulnerable groups (such as those with disability and mobility problems), personal economic circumstance through benefits and income and cultural factors associated with health behaviour and lifestyle should be included when policies to tackle the existence of 'food deserts' are formulated. These ideas are not new and have been neatly illustrated by a study on disadvantaged consumers by Westlake (1993) who found that these vulnerable groups found it particularly difficult to access healthy food, however when it comes to the 'food desert' debate a more systematic approach may be required i.e. this thesis concentrates on 'supply-side' reasons for poor food access whereas a 'demand-side' approach may also be useful. Recent food retail store openings have been undertaken by Tesco plc in the deprived estates of Seacroft, Leeds and Springburn, Glasgow (Cunningham 2000, Brindle 1999). These initiatives provide job skill projects, guaranteed job interviews and educational initiatives to local residents as part of the store development process and may be the sort of partnership approach which works to combat the wider causes of food poverty.

This project is the largest and most systematic study of spatial variations in food price and availability undertaken to date in the UK. The price and availability of food has been found, in the majority of cases, not to significantly differ between areas at a variety of spatial scales. Those food items that did significantly differ in price were found, for the most part, to be cheaper in poorer areas. For food availability no real pattern was detected. The location of food shopping opportunities in the city was, on the whole,

evenly distributed and the stores that present the greatest opportunities in terms of price efficiency and food availability were evenly distributed in poorer areas. In general some of these foods which did differ significantly in price and availability were items whose consumption is discouraged in contemporary dietary guidelines. Previous literature has suggested that food is more expensive and less available in poorer urban areas and that some deprived urban areas do not have adequate food shopping facilities. This study provides some evidence that this is not the case in Glasgow in the late 1990s. Changes in the food retail economy since the early to mid 1990s and the saturation of food retail market in the UK may have precipitated this change.

These results do come with a health warning. These results are for Glasgow only, and do not fully consider the rural and semi-rural fringes of the Greater Glasgow area due to data reporting problems, thus care must be taken when generalising findings to areas out side of Glasgow. However, recent, unpublished, evidence from London does support the thesis presented here (Dowler & Donkin, pers comm). Future work should now seek to widen the evidence base for food deserts, which is, at this point equivocal and based upon small, unrepresentative and very local case studies (see Chapter 1). Work should also begin on evaluating and formulating wide-ranging interventions to improve food access for those who are still in food poverty.

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APPENDIX A

Contact Letter to Director of Environmental Health

24 May 1996

Chief Environmental Health Officer
Environmental Services
City of Glasgow Council
City Chambers
George Square
Glasgow G2 IDU

Dear Sir,

Diet and Health in Glasgow

In light of recommendations of The Scottish Diet Report (Scottish Office, 1993) and the knowledge that the diets of Glaswegians are very poor from a health point of view, I am conducting an investigation into differences in diet between differing neighbourhoods within Glasgow and would value your advice.

This PhD study aims to explore whether variations in diet are mainly due to differences in demand (people in different areas preferring different types of food) or to differences in supply (the price and availability of foods in different areas).

In light of your professional activities in food hygiene, health and safety, your help would be valuable to me in designing this research. I hope to start the price and availability survey within the next few months and to decide upon my sampling frame I have collected information (from the planning department) on food retailers in Glasgow. Unfortunately they only contain records on large corporate chains and do not include independent food stores. I understand that under food hygiene guidelines authorities are required to carry out periodic checks on food retailers. Does environmental health have a list of addresses for food retailers in Glasgow? If not, do you have a health and safety department which may have this sort of information?

I look forward to hearing from you

Yours faithfully,
Steven Cummins

MRC
Medical Research Council

UNIVERSITY
of
GLASGOW

Diet, Health & Area of Residence

The Medical Research Council's Medical Sociology Unit based at the University of Glasgow, is studying diet and health within the Greater Glasgow Health Board area.

In light of the recommendations of *The Scottish Diet Report* (Scottish Office, 1993) and the knowledge that the diets of many Glaswegians do not meet current guidelines for healthy eating. We are investigating how the price and availability of a range of standard food items differs between differing neighbourhoods in Glasgow.

Previous research has shown that even after accounting for differences in sex, income, age and socio-economic variables, variations in diet between neighbourhoods still persist. This survey aims to explore whether these variations are mainly due to differences in demand (people in different areas preferring different things) or to differences in supply (the price and availability of food in different areas).

We would be grateful if we could have your co-operation when collecting our field data. We wish to collect data on the prices of a wide range of foods that may or may not be available within your store. The information gathered is strictly confidential and will be for the sole use of the research team. No person or organisation will be identifiable in the published reports of this study.

If you have any queries or questions concerning any aspect of this study please do not hesitate to write or telephone Steven Cummins at the address below.

Thank you for your help.

MRC Medical Sociology Unit
6 Lilybank Gardens
Glasgow
G12 8RZ

Telephone: 0141-357 3949 *Fax:* 0141-337 2389 *Email*: steven@msoc.mrc.gla.ac.uk

Date :	ID NO:		Opening Hours	Ethnic Owned	Ethnic Food	
Shop	**Locality**	**Manager**	**Postcode**		**Shop Type**	
Food Item	**Weight**	**Cheapest Price**	**Most Expensive Price**	**Not Available**	**Specific Brand**	**Price**
White Bread (large, sliced)	800g				Kingsmill	
White Bread (small unsliced)					n/a	
White Rolls (Baps)	each				n/a	
Wholemeal Bread (large, sliced)	800g				Allinsons	
Wholemeal Bread (small, sliced)	400g				Hovis	
Cornflakes	500g				Kellogs	
Weetabix / Shredded Wheat	24				Weetabix	
Spaghetti (dried)	500g				Marshalls	
Spaghetti (tinned)	medium tin				Heinz	
Jam Tarts	6/8 pack				Own brand	
Digestive Biscuits	400g				McVities	
Digestive Biscuits (Chocolate)	400g				McVities	
Teacakes	1pkt of 4/6				Sunblest / own brand	
Beef (Topside)	per lb				n/a	
Beef Mince	per lb				n/a	
Bacon (streaky)	8 rashers				n/a	
Chicken breast fillets	per lb				n/a	

Sausages (pork)	per lb (454g)				Wall's / Local Scottish	
Hamburgers (frozen)	4 pack				Bird's Eye	
Fresh Cod fillets	per lb				n/a	
Tuna (tinned, in brine)	medium tin				Princes' / John West	
Fish fingers	10 pack				Bird's Eye	
Butter	per packet				Anchor	
Margarine (polyunsaturated)	500g				Flora	
Vegetable Oil	per litre				Own brand	
Full milk	per litre				R.Wiseman / Scot Pride	
Semi - skimmed milk	per litre				R. Wiseman / Scot Pride	
Yoghurt (fruit)	125g (sml pot)				Ski / other equiv	
Cheddar Cheese	per kg				Edam	
Eggs (medium)	half dozen				Local / own brand	
New Potatoes	per lb				Class 1	
Old Potatoes (baking)	per lb				Class 1	
Frozen Chips	2lb bag				Mc Cains' Straight cut	
Cabbage	per lb				Class 1	
Lettuce (iceberg)	each				Class 1	
Carrots	per lb				Class 1	

Cucumber (whole)	each				Class 1	
Tomatoes	per lb				Class 1	
Onions	per lb				Class 1	
Baked Beans	450 g				Heinz	
Tomatoes (tinned)	400g				Napolina	
Peas (frozen)	2lb bag				Bird's Eye	
Oranges	each				Class 1	
Apples	per lb				Granny Smith Class 1	
Bananas	per lb				Class 1	
Sultanas	500g					
Orange Juice	per litre				Del Monte	
Pears (or other seasonal soft fruit)	per lb				Class 1	
Sugar (granulated)	per kg				T & L / Silver Spoon	
Strawberry Jam	454g (or near wt)				Hartleys (or equiv)	
Flour	Stnd Bag				Ownbrand / Homepride	
Tomato Soup	Medium				Heinz	
Tea bags	250g				PG Tips	
Instant coffee	100g				Nescafe	
Drinking Chocolate	125g				Cadbury's	
Coke	2ltr				Coca Cola	
Chocolate Bar	small bar (65g)				Cadbury's Dairy Milk	

Manufacturer Brands used in Study

Kingsmill White Sliced Bread (Large)

Allinson's Wholemeal Sliced Bread (Large)

Hovis Wholemeal Sliced Bread (Small)

Kellog's Cornflakes (500g)

Weetabix Wheat Biscuits (24 pieces)

Marshall's Dried Spaghetti (500g)

Heinz Tinned Spaghetti (medium tin)

Jam Tarts

McVities Plain Digestive Biscuits (400g)

McVities Milk Chocolate Digestive Biscuits (400g)

Sunblest Teacakes (4 pack)

Hall's Pork Sausages (454g)

Bird's Eye Beefburgers (frozen 4 pack)

Prince's / John West Tinned Tuna in brine (medium tin)

Bird's Eye Fish Fingers (10 pack)

Anchor Butter

Flora Margarine (500g)

Wiseman / Scottish Pride Full Milk (per litre)

Wiseman / Scottish Pride Semi-skimmed Milk (per litre)

Ski Fruit Yoghurt (125g small pot)

Edam Cheddar Cheese (per kg)

Class 1 New Potatoes (per lb)

Class 1 Old Potatoes (per 1b)

McCains Frozen Oven Chips (2lb bag)

Class 1 Cabbage (per lb)

Class 1 Iceberg Lettuce (each)

Class 1 Carrots (per lb)

Class 1 Cucumber (whole)

Class 1 Tomatoes (per lb)

Class 1 Onions (per lb)

Heinz Baked Beans (450g)

Napolina Tinned Tomatoes (400g)

Bird's Eye Frozen Peas (2lb bag)

Class 1 Oranges (each)

Class 1 Apples (Granny Smith per lb)

Class 1 Banana's (per lb)

Del Monte Fresh Orange Juice (per litre)

Class 1 Pears (per lb)

Tate & Lyle / Silver Spoon Sugar (per kg)

Hartley's Strawberry Jam (454g or near weight)

Homepride Flour (Std Bag)

PG Tips Tea Bags (250g – 80's)

Nescafe Instant Coffee (100g)

Cadbury's Drinking Chocolate (125g)

Coca-Cola (2 litres)

Cadbury's Dairy Milk Chocolate Bar (65g)

APPENDIX B

Table A Mean lowest priced food item by shop type (all cases)

Food Item	Multiple		Discounter		Freezer Store		Affiliated Indpndnt		Indpndnt Grocer		Butcher		Fruit & Veg		Baker		Fish'mngr		Deli.		Signif.
	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	
White Sliced (lge)	.26	(39)	.21	(25)	.31	(8)	.46	(9)	.53	(83)			.60	(1)	.57	(14)			.88	(1)	***
White unsliced (sml)	.45	(25)					.39	(3)	.45	(4)					.45	(15)			.77	(1)	***
White Baps	.16	(26)	.04	(7)			.15	(5)	.13	(42)			.15	(1)	.13	(15)			.11	(1)	***
Wh'meal Sliced (lge)	.41	(39)	.33	(25)	.55	(8)	.68	(9)	.72	(65)			.71	(1)	.65	(14)			.88	(1)	***
Wh'meal Sliced (sml)	.44	(8)	.42	(25)	.44	(8)	.55	(8)	.52	34			.52	1	.53	13			.57	1	***
Cornflakes	.54	39	.62	25	.89	8	1.11	9	1.19	56			1.39	1					1.55	1	***
Wheat Cereal Biscuits	.88	38	1.00	25	.95	8	1.13	9	1.29	44			1.30	1							***
Spaghetti (dried)	.27	39	.19	25			.57	9	.65	44									.59	1	***
Spaghetti (tinned)	.19	39	.05	25	.25	3	.36	9	.36	63			.37	1							***
Jam Tarts	.35	14	.39	1	.45	8	.79	1	.73	7					.64	4					***
Digestive Bisc'ts (plain)	.45	39	.47	25	.65	8	.55	9	.80	72											***
Digestive Bisc'ts (choc)	.77	37	.55	25	1.09	8	.81	9	1.10	70											***
Teacakes	.67	7							.73	10					.69	5					ns
Beef (topside)	5.57	25	4.29	18					3.72	1	4.25	21									*
Beef (mince)	2.58	38	1.50	8			1.82	1	2.29	24											***
Bacon (str'ky)	1.32	39	1.09	18	.99	8	1.62	9	1.85	22	1.67	23	1.99	1					1.55	3	***
Chicken	5.80	38	4.32	7	5.58	11					5.51	8							2.38	3	*
Sausages	.53	39	.46	25	.99	8	.99	9	1.11	37	1.08	23	1								***

Burgers	.62	38	.46	25	.63		.91	4	1.00	27	2.04	14								***
Cod Fillets	6.91	17											2.98	1			5.94	7		ns
Tuna (tinned)	.45	38	.27	25	.42	11	.59	9	.75	67			.72	1					.69	1	***
Fish Fingers	.40	38	.46	25	.89	3	1.60	9	1.13	20										***
Butter	.60	39	.33	25	.64	8	.79	9	.89	55									.87	4	***
Margarine	.51	39	.63	25	.69	8	.79	9	.71	54									.92	1	***
Vegetable Oil	.61	38	.53	25	.69	8	.80	9	.91	37	1.40	1								***
Milk (full)	.49	39	.45	25	.54	11	.63	9	.62	93			.69	1						***
Milk (semi)	.49	39	.45	25	.55	11	.62	9	.62	93			.69	1					.55	3	***
Yoghurt	.14	39	.15	25			.26	9	.29	32									.31	4	***
Cheese (Cheddar)	3.36	39	2.49	25	3.89	8	4.40	9	5.56	53			5.79	1					4.16	4	***
Eggs	.60	39	.43	25	.81	11	.77	4	.62	41	.68	12	.65	3	.61	1			.75	3	***
Potatoes (new)	.23	38	.11	25			.29	6	.30	12			.24	13					.49	3	***
Potatoes (old)	.21	38	.15	7			.16	6	.18	26			.14	18					.12	3	***
Chips (frozen)	.77	38	.50	25	.83	11	1.15	4	1.43	10										***
Cabbage	.21	37	.22	24			.49	1	.39	6			.34	14					.35	3	***
Lettuce (iceberg)	.54	38	.54	25	.59	1	.79	1	.62	13			.59	19					.69	3	*
Carrots	.18	38	.21	25	.39	1	.28	6	.24	15			.21	18					.25	3	***
Cucumber	.44	38	.47	25	.49	1	.39	5	.57	12			.55	18					.79	3	***
Tomatoes (fresh)	.55	38	.49	25	.69	1	.59	5	.69	25			.65	20					.69	3	***
Onions	.20	38	.18	25	.69	1	.28	6	.29	23			.23	18							***
Baked Beans	.16	38	.09	25	.31	11	.36	9	.34	71	.35	1	.37	1					.37	1	***
Tomatoes (tinned)	.13	38	.09	25	.19	8	.26	9	.33	29			.39	1					.42	1	***
Peas (frozen)	.57	38	.24	24	.59	8	1.29	4	1.80	5											***
Oranges	.19	38	.20	19			.23	6	.23	24			.18	19					.29	3	***
Apples	.41	38	.39	25	.45	1	.51	6	.64	30			.60	20					.39	3	***
Bananas	.46	38	.43	25	.45	1	.56	6	.55	23			.46	19					.59	3	***
Sultanas	.80	37	.59	1			.85	5	.92	12											***
Orange Juice	.39	39	.35	25	.88	11	.71	9	.73	51			.82	2					1.47	4	***
Pears	.43	38	.38	24	.45	1	.49	5	.58	6			.44	15					.39	3	***

Sugar	.68	.38	.57	25	.78	11	.74	9	.82	67	.82	1			.79	1	***
Jam	.53	36	.57	25			.83	9	.86	42					1.35	1	***
Flour	.19	33	.14	25	.79	8	.64	5	.86	34							***
Tea Bags	.70	38	.74	25	.79	11	.93	9	1.27	55	1.79	1	1.69	1	2.07	4	***
Instant Coffee	.83	38	.54	25	1.41	11	1.08	9	1.69	67	2.82	1	1.85	1	2.71	4	***
Drinking Choc	.86	37	.43	18	.99	8	1.05	5	1.03	8			.99	1			***
Soup (tomato)	.31	37	.22	25	.47	8	.41	9	.47	79					.98	4	***
Cola	.61	38	.18	25	.99	11	.82	9	1.26	75			1.29	1	1.17	1	***
Chocolate	.33	4					.27	9	.27	87			.29	1			**

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$)

Table B Mean price of branded food items by shop type (all cases)

Food Item	Multiple		Discounter		Freezer Store		Affiliated Indpndnt		Indpndnt Grocer		Butcher		Fruit & Veg		Baker		Fish'mngr		Deli.		Signif.
	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	
Kingsmill White (lge)	.57	25	.48	18	.49	8	.70	6	.66	51			.60	1							***
Allinsons Wholemeal Sliced (lge)	.53	25			.62	8	.78	4	.75	38			.71	1	.69	1					***
Hovis Wholemeal Sliced (sml)	.46	31	.29	1			.55	9	.49	23			.52	1							*
Kellogs Cornflakes	1.09	38	.99	18			1.18	9	1.27	49			1.39	1					1.55	1	***
Weetabix	1.09	38	1.02	18			1.16	9	1.30	42			1.30	1							***
Marshalls Spaghetti (dried)	.59	24							.67	7											***
Heinz Spaghetti (tinned)	.33	38	.25	18			.38	9	.36	63			.37	7							***
Jam Tarts																					
McVities Digestive Bisc'ts (plain)	.68	38	.63	18			.69	9	.80	69											***
McVities Digestive Bisc'ts (choc)	1.09	36	.73	18	1.09	8	1.01	9	1.12	70											***
Sunblest Teacakes																					
Beef (topside)																					
Beef (mince)																					

Bacon (str'ky)																		
Chicken																		
Hall's	.89	1					.99	9	1.00	17	1.02	4	.99	1				ns
Sausages																		
Bird's Eye	.99	38	.99	18	.99	8	.99	4	1.00	26								ns
Burgers																		
Cod Fillets																		
Princes'	.62	38	.53	18	.59	8	.75	1	.76	66			.72	1				***
Tuna (tinned)																		
Bird's Eye	.97	27					1.60	9	1.20	19								***
Fish Fingers																		
Anchor	.74	38	.58	18	.64	8	.86	9	.93	33						.99	1	***
Butter																		
Flora	.94	38	.93	18	.95	8	.95	9	1.03	46								***
Margarine																		
Vegetable Oil																		
Wiseman	.57	6	.46	18	.55	11	.68	6	.62	92			.69	1		.55	3	***
Milk (full)																		
Wiseman	.55	31	.46	18	.55	11	.66	6	.62	92			.69	1		.55	3	***
Milk (semi)																		
Yoghurt																		
Edam Cheese	3.67	34	3.50	25	3.89	8	4.43	7	4.51	7						4.16	4	***
(Cheddar)																		
Class 1Eggs	.60	36	.44	24	.81	11	.77	4	.61	40	.68	12	.65	3	.61	.75	3	***
Class 1	.23	38	.11	25			.29	6	.30	12			.24	12		.49	3	***
Potatoes																		
(new)																		
Class 1	.21	33	.15	7			.16	6	.18	26			.14	18		.12	3	**
Potatoes																		
(old)																		
McCain's	.97	32			.99	8	1.15	4	1.43	10								***
Straight																		
Chips (frozen)																		
Class 1	.21	37	.22	24			.49	1	.39	6			.33	13		.35	3	***
Cabbage																		

Class 1 Lettuce (iceberg)	.53	38	.54	25	.59	1	.79	1	.70	11			.68	18		.69	3	***
Class 1 Carrots	.19	38	.21	25	.39	1	.28	6	.24	15			.21	18		.25	3	***
Class 1 Cucumber	.44	38	.47	25	.49	1	.39	5	.57	12			.55	18		.79	3	***
Class 1 Tomatoes (fresh)	.55	38	.49	25	.69	1	.59	5	.70	24			.67	20		.69	3	***
Class 1 Onions	.20	38	.18	25	.69	1	.28	6	.29	22			.23	18				***
Heinz Baked Beans	.34	38	.28	18	.33	8	.36	9	.36	70	.35	1	.37	1		.37	1	***
Napolina Tomatoes (tinned)	.32	37							.42	9								***
Bird's Eye Peas (frozen)	1.22	38	.63	18	.89	8	1.29	4	1.80	5								***
Class 1 Oranges	.19	38	.20	19			.23	6	.23	24			.18	19		.29	3	***
Class 1 Apples	.50	38	.54	25	.45	1	.51	6	.67	22			.64	18		.59	3	***
Class 1 Bananas Sultanas	.46	38	.43	25	.45	1	.56	6	.53	20			.46	19		.59	3	***
Del Monte Orange Juice	.86	37	.83	18	.99	8	.79	1	.83	12			.79	1		1.29	3	***
Class 1 Pears	.48	38	.38	24	.45	1	.49	5	.57	5			.44	15		.39	3	**
Tate & Lyle Sugar	.68	38	.57	24	.78	11	.74	9	.82	67						.79	1	***
Strawberry Jam	.87	1					.87	4	.88	36								ns
Homepride Flour	.75	20	.68	18			.64	5	.81	25								***

PG Tips Tea Bags	1.58	36	1.57	18			1.59	4	1.82	14				1.99	1	***
Nescafe Instant Coffee	1.91	38	1.65	18	1.69	8	1.97	9	2.11	64	1.85	1		2.71	4	***
Cadbury's Drinking Choc	.99	24	.62	18			1.05	5	1.03	7	.99	1				***
Heinz Soup (tomato)	.47	36	.45	18	.47	8	.50	9	.47	79						***
Coca-Cola	1.25	38			.99	8	1.27	9	1.28	74	1.29	1		1.17	1	***
Cadbury's Chocolate Bar (sml)	.27	1					.27	9	.27	84	.29	1				ns

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table C Mean price difference between the least and most expensive food items by shop type (all cases)

Food Item	Multiple		Discounter		Freezer Store		Affiliated Indpndnt		Indpndnt Grocer		Butcher		Fruit & Veg		Baker		Fish'mngr		Deli.		Signif.
	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	£	N	
White Sliced (lge)	.39	39	.27	25	.28	8	.21	9	.11	83			.00	1	.11	14			.00	1	***
White unsliced (sml)	.02	25					.10	3	.00	4					.11	15			.00	1	***
White Baps	.00	26	.00	7			.00	5			.00	1	.01	15					.00	1	ns
Wh'meal Sliced (lge)	.34	38	.02	25	.18	8	.18	9	.26	34			.23	1	.28	12			.31	1	***
Wh'meal Sliced (sml)	.11	38	.06	25	.00	8	.00	9	.00	34			.00	1	.08	13			.00	1	***
Cornflakes	.56	39	.23	25	.00	8	.07	9	.07	56			.00	1					.00	1	***
Wheat Cereal Biscuits	.21	38	.00	25	.00	8	.03	9	.00	44			.00	1							***
Spaghetti (dried)	.40	39	.29	25			.00	9	.04	44									1.30	1	***
Spaghetti (tinned)	.15	39	.14	25	.00	3	.02	9	.00	63			.00	1							***
Jam Tarts	.20	14	.00	1	.00	8	.00	1	.00	7					.00	4					*
Digestive Bisc'ts (plain)	.23	39	.09	25	.00	8	.13	9	.00	72											***
Digestive Bisc'ts (choc)	.31	37	.19	25	.00	8	.20	9	.02	70											***
Teacakes	.03	7							.00	10					.00	5					***
Beef (topside)	.00	25	.00	18					.00	1	1.09	21									***
Beef (mince)	1.63	38	1.21	18	3.39	8			.17	1	1.22	24									***
Bacon (str'ky)	.17	39	.00	18	.00	8	.00	9	.00	22	.12	23	.00	1					.00	3	**
Chicken	.75	38	1.63	7	.00	11					.00	8							.00	3	***
Sausages	.99	39	.96	25	.56	8	.22	9	.02	37	.24	23	.00	1							***
Burgers	.38	38	.39	25	.36	11	.09	4	.00	27	.00	14									***
Cod Fillets	.00	17									.00	1					.13	7			ns
Tuna (tinned)	.17	38	.22	25	.15	11	.08	9	.01	67			.00	1					.00	1	***

Fish Fingers	.71	38	.00	25	.00	3	.00	9	.18	20								***
Butter	.39	39	.50	25	.35	8	.14	9	.11	55							.12	4	***
Margarine	.47	39	.16	25	.30	8	.30	9	.27	54							.00	1	***
Vegetable Oil	.64	38	.30	25	.36	8	.03	9	.08	37	.00	1							***
Milk (full)	.04	39	.00	25	.00	11	.00	9	.00	93			.00	1			.00	3	***
Milk (semi)	.05	39	.00	25	.00	11	.00	9	.00	93			.00	1			.00	3	***
Yoghurt	.20	39	.12	25			.11	9	.03	32							.10	4	***
Cheese (Cheddar)	3.49	39	2.91	25	1.90	8	2.38	9	.25	53			.00	1			3.13	4	***
Eggs	.31	39	.00	25	.00	11	.00	4	.00	41	.00	12	.00	3	.00	1	.00	3	***
Potatoes (new)	.00	38	.12	25			.00	6	.00	12			.00	13			.00	3	***
Potatoes (old)	.00	38	.00	7			.00	6	.00	26			.00	18			.03	3	***
Chips (frozen)	.00	38	.00	25	.00	11	.00	4	.00	10									-
Cabbage	.43	37	.15	24			.00	1	.00	6			.04	14			.24	3	***
Lettuce (iceberg)	.00	38	.00	25	.00	1	.00	1	.04	13			.07	19			.00	3	**
Carrots	.01	38	.00	25	.00	1	.00	6	.00	15			.00	18			.00	3	***
Cucumber	.00	38	.00	25	.00	1	.00	5	.00	12			.00	18			.00	3	-
Tomatoes (fresh)	.42	38	.00	25	.00	1	.00	5	.01	25			.03	20			.10	3	***
Onions	.00	38	.00	25	.00	1	.00	6	.00	23			.00	18					-
Baked Beans	.27	38	.14	25	.00	11	.00	9	.02	71	.00	1	.00	1			.00	1	***
Tomatoes (tinned)	.23	38	.12	25	.07	8	.00	9	.03	29			.00	1			.00	1	***
Peas (frozen)	.73	38	.29	24	.30	8	.00	4	.00	5									***
Oranges	.00	38	.08	19			.00	6	.00	24			.00	19			.00	3	***
Apples	.30	38	.14	25	.00	1	.17	6	.03	31			.09	20			.30	3	***
Bananas	.00	38	.00	25	.00	1	.00	6	.00	23			.00	19			.00	3	-
Sultanas	.13	37	.00	1			.00	5	.00	12									***
Orange Juice	1.25	39	.35	25	.00	11	.00	9	.04	51	.04	51			.00	2	.00	4	***
Pears	.11	38	.23	24	.00	1	.00	5	.01	6			.03	15			.30	3	***
Sugar	.00	38	.00	25	.00	11	.00	9	.00	67	.00	1					.00	1	-
Jam	.44	36	.15	25			.04	9	.04	42							.00	1	***
Flour			.				.00	5	.04	34									***

Tea Bags	1.14	38	.69	25	.68	11	.93	9	.57	55	.00	1	.00	1	.00	4	***
Instant Coffee	2.41	38	1.56	25	.84	11	.90	.9	.58	67	.00	1	.44	1	.00	4	***
Drinking Choc	.09	37	.19	18	.00	8	.00	5	.00	8			.00	1			***
Soup (tomato)	.28	37	.17	25	.00	8	.13	9	.00	79					.36	4	***
Cola	.65	38	.42	25	.00	11	.45	9	.03	75			.00	1	.00	1	***
Chocolate	.14	4					.08	9	.07	87			.06	1			ns

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table D Mean lowest priced food item by shop type (multiple stores)

Food Item	Multiple		Discounter		Freezer Store		Signif.
	£	(N)	£	(N)	£	(N)	
White Sliced (lge)	.26	(39)	.21	(25)	.31	(8)	***
White unsliced (sml)	.45	(25)	-	-	-	-	***
White Baps	.16	(26)	.04	(7)			***
Wh'meal Sliced (lge)	.41	(39)	.33	(25)	.55	(8)	***
Wh'meal Sliced (sml)	.44	(8)	.42	(25)	.44	(8)	ns
Cornflakes	.54	39	.62	25	.89	8	***
Wheat Cereal	.88	38	1.00	25	.95	8	**
Biscuits							
Spaghetti (dried)	.27	39	.19	25			**
Spaghetti (tinned)	.19	39	.05	25	.25	3	***
Jam Tarts	.35	14	.39	1	.45	8	*
Digestive Bisc'ts (plain)	.45	39	.47	25	.65	8	***
Digestive Bisc'ts (choc)	.77	37	.55	25	1.09	8	***
Teacakes	.67	7					-
Beef (topside)	5.57	25	4.29	18			*
Beef (mince)	2.58	38	1.50	8			***
Bacon (str'ky)	1.32	39	1.09	18	.99	8	***
Chicken	5.80	38	4.32	7	5.58	11	ns
Sausages	.53	39	.46	25	.99	8	***
Burgers	.62	38	.46	25	.63	.91	**
Cod Fillets	6.91	17					-
Tuna (tinned)	.45	38	.27	25	.42	11	***
Fish Fingers	.40	38	.46	25	.89	3	***
Butter	.60	39	.33	25	.64	8	***
Margarine	.51	39	.63	25	.69	8	**
Vegetable Oil	.61	38	.53	25	.69	8	***
Milk (full)	.49	39	.45	25	.54	11	***
Milk (semi)	.49	39	.45	25	.55	11	***
Yoghurt	.14	39	.15	25			ns
Cheese (Cheddar)	3.36	39	2.49	25	3.89	8	***
Eggs	.60	39	.43	25	.81	11	***
Potatoes (new)	.23	38	.11	25			***
Potatoes (old)	.21	38	.15	7			***
Chips (frozen)	.77	38	.50	25	.83	11	***
Cabbage	.21	37	.22	24			ns
Lettuce (iceberg)	.54	38	.54	25	.59	1	ns
Carrots	.18	38	.21	25	.39	1	***
Cucumber	.44	38	.47	25	.49	1	ns
Tomatoes (fresh)	.55	38	.49	25	.69	1	***
Onions	.20	38	.18	25	.69	1	***
Baked Beans	.16	38	.09	25	.31	11	***

Tomatoes (tinned)	.13	38	.09	25	.19	8	***
Peas (frozen)	.57	38	.24	24	.59	8	***
Oranges	.19	38	.20	19			**
Apples	.41	38	.39	25	.45	1	ns
Bananas	.46	38	.43	25	.45	1	ns
Sultanas	.80	37	.59	1			***
Orange Juice	.39	39	.35	25	.88	11	***
Pears	.43	38	.38	24	.45	1	**
Sugar	.68	.38	.57	25	.78	11	***
Jam	.53	36	.57	25			*
Flour	.19	33	.14	25	.79	8	***
Tea Bags	.70	38	.74	25	.79	11	ns
Instant Coffee	.83	38	.54	25	1.41	11	***
Drinking Choc	.86	37	.43	18	.99	8	***
Soup (tomato)	.31	37	.22	25	.47	8	***
Cola	.61	38	.18	25	.99	11	***
Chocolate	.33	4					-

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table E Mean price of branded food items by shop type (multiple stores)

Food Item	Multiple		Discounter		Freezer Store		Signif.
	£	N	£	N	£	N	
Kingsmill White (lge)	.57	25	.48	18	.49	8	***
Allinsons Wholemeal Sliced (lge)	.53	25			.62	8	**
Hovis Wholemeal Sliced (sml)	.46	31	.29	1			ns
Kellogs Cornflakes	1.09	38	.99	18			***
Weetabix	1.09	38	1.02	18			-
Marshalls Spaghetti (dried)	.59	24					-
Heinz Spaghetti (tinned)	.33	38	.25	18			***
Jam Tarts							-
McVities Digestive Bisc'ts (plain)	.68	38	.63	18			**
McVities Digestive Bisc'ts (choc)	1.09	36	.73	18	1.09	8	***
Sunblest Teacakes							-
Beef (topside)							-
Beef (mince)							-
Bacon (str'ky)							-
Chicken							-
Hall's Sausages	.89	1					-
Bird's Eye Burgers	.99	38	.99	18	.99	8	ns
Cod Fillets							-
Princes' Tuna (tinned)	.62	38	.53	18	.59	8	***
Bird's Eye Fish Fingers	.97	27					-
Anchor Butter	.74	38	.58	18	.64	8	***
Flora Margarine	.94	38	.93	18	.95	8	***
Vegetable Oil							-
Wiseman Milk (full)	.57	6	.46	18	.55	11	***
Wiseman Milk (semi)	.55	31	.46	18	.55	11	***
Yoghurt							-
Edam Cheese (Cheddar)	3.67	34	3.50	25	3.89	8	***
Class 1Eggs	.60	36	.44	24	.81	11	***

Class 1 Potatoes (new)	.23	38	.11	25			***
Class 1 Potatoes (old)	.21	33	.15	7			***
McCain's Straight Chips (frozen)	.97	32			.99	8	ns
Class 1 Cabbage	.21	37	.22	24			ns
Class 1 Lettuce (iceberg)	.53	38	.54	25	.59	1	ns
Class 1 Carrots	.19	38	.21	25	.39	1	***
Class 1 Cucumber	.44	38	.47	25	.49	1	ns
Class 1 Tomatoes (fresh)	.55	38	.49	25	.69	1	***
Class 1 Onions	.20	38	.18	25	.69	1	***
Heinz Baked Beans	.34	38	.28	18	.33	8	***
Napolina Tomatoes (tinned)	.32	37					-
Bird's Eye Peas (frozen)	1.22	38	.63	18	.89	8	***
Class 1 Oranges	.19	38	.20	19			**
Class 1 Apples	.50	38	.54	25	.45	1	ns
Class 1 Bananas	.46	38	.43	25	.45	1	ns
Sultanas							-
Del Monte Orange Juice	.86	37	.83	18	.99	8	***
Class 1 Pears	.48	38	.38	24	.45	1	*
Tate & Lyle Sugar	.68	38	.57	24	.78	11	***
Strawberry Jam	.87	1					-
Homepride Flour	.75	20	.68	18			***
PG Tips Tea Bags	1.58	36	1.57	18			***
Nescafe Instant Coffee	1.91	38	1.65	18	1.69	8	***
Cadbury's Drinking Choc	.99	24	.62	18			-
Heinz Soup (tomato)	.47	36	.45	18	.47	8	***
Coca-Cola	1.25	38			.99	8	-
Cadbury's Chocolate Bar (sml)	.27	1					-

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table F Mean price difference between the least and most expensive food items by shop type (multiple stores)

Food Item	Multiple		Discounter		Freezer Store		Signif.
	£	N	£	N	£	N	
White Sliced (lge)	.39	39	.27	25	.28	8	***
White unsliced (sml)	.02	25	-	-	-	-	-
White Baps	.00	26	.00	7			*
Wh'meal Sliced (lge)	.34	38	.02	25	.18	8	***
Wh'meal Sliced (sml)	.11	38	.06	25	.00	8	***
Cornflakes	.56	39	.23	25	.00	8	***
Wheat Cereal Biscuits	.21	38	.00	25	.00	8	***
Spaghetti (dried)	.40	39	.29	25			**
Spaghetti (tinned)	.15	39	.14	25	.00	3	*
Jam Tarts	.20	14	.00	1	.00	8	ns
Digestive Bisc'ts (plain)	.23	39	.09	25	.00	8	***
Digestive Bisc'ts (choc)	.31	37	.19	25	.00	8	***
Teacakes	.03	7					-
Beef (topside)	.00	25	.00	18			-
Beef (mince)	1.63	38	1.21	18	3.39	8	***
Bacon (str'ky)	.17	39	.00	18	.00	8	***
Chicken	.75	38	1.63	7	.00	11	***
Sausages	.99	39	.96	25	.56	8	**
Burgers	.38	38	.39	25	.36	11	ns
Cod Fillets	.00	17					-
Tuna (tinned)	.17	38	.22	25	.15	11	**
Fish Fingers	.71	38	.00	25	.00	3	***
Butter	.39	39	.50	25	.35	8	***
Margarine	.47	39	.16	25	.30	8	***
Vegetable Oil	.64	38	.30	25	.36	8	***
Milk (full)	.04	39	.00	25	.00	11	*
Milk (semi)	.05	39	.00	25	.00	11	***
Yoghurt	.20	39	.12	25			***
Cheese (Cheddar)	3.49	39	2.91	25	1.90	8	***
Eggs	.31	39	.00	25	.00	11	***
Potatoes (new)	.00	38	.12	25			***
Potatoes (old)	.00	38	.00	7			ns
Chips (frozen)	.00	38	.00	25	.00	11	ns
Cabbage	.43	37	.15	24			***
Lettuce (iceberg)	.00	38	.00	25	.00	1	ns
Carrots	.01	38	.00	25	.00	1	**
Cucumber	.00	38	.00	25	.00	1	ns

Tomatoes (fresh)	.42	38	.00	25	.00	1	***
Onions	.00	38	.00	25	.00	1	ns
Baked Beans	.27	38	.14	25	.00	11	***
Tomatoes (tinned)	.23	38	.12	25	.07	8	***
Peas (frozen)	.73	38	.29	24	.30	8	***
Oranges	.00	38	.08	19			***
Apples	.30	38	.14	25	.00	1	**
Bananas	.00	38	.00	25	.00	1	-
Sultanas	.13	37	.00	1			ns
Orange Juice	1.25	39	.35	25	.00	11	***
Pears	.11	38	.23	24	.00	1	**
Sugar	.00	38	.00	25	.00	11	-
Jam	.44	36	.15	25			***
Flour			.				-
Tea Bags	1.14	38	.69	25	.68	11	***
Instant Coffee	2.41	38	1.56	25	.84	11	***
Drinking Choc	.09	37	.19	18	.00	8	***
Soup (tomato)	.28	37	.17	25	.00	8	***
Cola	.65	38	.42	25	.00	11	***
Chocolate	.14	4					-

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table G Mean lowest priced food item by shop type (independent stores)

Food Item	Affiliated Indpndnt		Indpndnt Grocer		Butcher		Fruit & Veg		Baker		Fish'mngr		Deli.		Signif.
	£	N	£	N	£	N	£	N	£	N	£	N	£	N	
White Sliced (lge)	.46	(9)	.53	(83)			.60	(1)	.57	(14)			.88	(1)	**
White unsliced (sml)	.39	(3)	.45	(4)					.45	(15)			.77	(1)	***
White Baps	.15	(5)	.13	(42)			.15	(1)	.13	(15)			.11	(1)	ns
Wh'meal Sliced (lge)	.68	(9)	.72	(65)			.71	(1)	.65	(14)			.88	(1)	**
Wh'meal Sliced (sml)	.55	(8)	.52	34			.52	1	.53	13			.57	1	ns
Cornflakes	1.11	9	1.19	56			1.39	1					1.55	1	ns
Wheat Cereal Biscuits	1.13	9	1.29	44			1.30	1							***
Spaghetti (dried)	.57	9	.65	44									.59	1	ns
Spaghetti (tinned)	.36	9	.36	63			.37	1							ns
Jam Tarts	.79	1	.73	7					.64	4					ns
Digestive Bisc'ts (plain)	.55	9	.80	72											***
Digestive Bisc'ts (choc)	.81	9	1.10	70											***
Teacakes			.73	10					.69	5					ns
Beef (topside)			3.72	1	4.25	21									ns
Beef (mince)	1.82	1	2.29	24											ns
Bacon (str'ky)	1.62	9	1.85	22	1.67	23	1.99	1					1.55	3	**
Chicken					5.51	8							2.38	3	*
Sausages	.99	9	1.11	37	1.08	.99	1								ns
Burgers	.91	4	1.00	27	2.04	14									***
Cod Fillets							2.98	1			5.94	7			ns
Tuna (tinned)	.59	9	.75	67			.72	1					.69	1	***

Fish Fingers	1.60	9	1.13	20									***
Butter	.79	9	.89	55							.87	4	*
Margarine	.79	9	.71	54							.92	1	ns
Vegetable Oil	.80	9	.91	37	1.40	1							*
Milk (full)	.63	9	.62	93			.69	1					*
Milk (semi)	.62	9	.62	93			.69	1			.55	3	ns
Yoghurt	.26	9	.29	32							.31	4	ns
Cheese (Cheddar)	4.40	9	5.56	53			5.79	1			4.16	4	***
Eggs	.77	4	.62	41	.68	12	.65	3	.61	1	.75	3	***
Potatoes (new)	.29	6	.30	12			.24	13			.49	3	ns
Potatoes (old)	.16	6	.18	26			.14	18			.12	3	ns
Chips (frozen)	1.15	4	1.43	10									***
Cabbage	.49	1	.39	6			.34	14			.35	3	ns
Lettuce (iceberg)	.79	1	.62	13			.59	19			.69	3	ns
Carrots	.28	6	.24	15			.21	18			.25	3	*
Cucumber	.39	5	.57	12			.55	18			.79	3	***
Tomatoes (fresh)	.59	5	.69	25			.65	20			.69	3	ns
Onions	.28	6	.29	23			.23	18					*
Baked Beans	.36	9	.34	71	.35	1	.37	1			.37	1	ns
Tomatoes (tinned)	.26	9	.33	29			.39	1			.42	1	***
Peas (frozen)	1.29	4	1.80	5									*
Oranges	.23	6	.23	24			.18	19			.29	3	***
Apples	.51	6	.64	30			.60	20			.39	3	**
Bananas	.56	6	.55	23			.46	19			.59	3	**
Sultanas	.85	5	.92	12									ns
Orange Juice	.71	9	.73	51			.82	2			1.47	4	***
Pears	.49	5	.58	6			.44	15			.39	3	***
Sugar	.74	9	.82	67	.82	1					.79	1	***
Jam	.83	9	.86	42							1.35	1	***
Flour	.64	5	.86	34									*

Tea Bags	.93	9	1.27	55	1.79	1	1.69	1		2.07	4	**
Instant Coffee	1.08	9	1.69	67	2.82	1	1.85	1		2.71	4	***
Drinking Choc	1.05	5	1.03	8			.99	1				ns
Soup (tomato)	.41	9	.47	79						.98	4	***
Cola	.82	9	1.26	75			1.29	1		1.17	1	***
Chocolate	.27	9	.27	87			.29	1				ns

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table H Mean price of branded food items by shop type (independent stores)

Food Item	Affiliated Indpndnt		Indpndnt Grocer		Butcher		Fruit & Veg		Baker		Fish'mngr		Deli.		Signif.
	£	N	£	N	£	N	£	N	£	N	£	N	£	N	
Kingsmill White (lge)	.70	6	.66	51			.60	1							*
Allinsons Wholemeal Sliced (lge)	.78	4	.75	38			.71	1	.69	1					ns
Hovis Wholemeal Sliced (sml)	.55	9	.49	23			.52	1							ns
Kellogs Cornflakes	1.18	9	1.27	49			1.39	1					1.55	1	***
Weetabix	1.16	9	1.30	42			1.30	1							***
Marshalls Spaghetti (dried)			.67	7											-
Heinz Spaghetti (tinned)	.38	9	.36	63			.37	7							***
McVities Digestive Bisc'ts (plain)	.69	9	.80	69											***
McVities Digestive Bisc'ts (choc)	1.01	9	1.12	70											*
Sunblest Teacakes															-
Beef (topside)															-
Beef (mince)															-
Bacon (str'ky)															-
Chicken															-

Hall's Sausages	.99	9	1.00	17	1.02	4	.99	1					ns
Bird's Eye Burgers	.99	4	1.00	26									ns
Cod Fillets													-
Princes' Tuna (tinned)	.75	1	.76	66			.72	1					ns
Bird's Eye Fish Fingers	1.60	9	1.20	19									***
Anchor Butter	.86	9	.93	33							.99	1	*
Flora Margarine	.95	9	1.03	46									*
Vegetable Oil													*
Wiseman Milk (full)	.68	6	.62	92			.69	1			.55	3	***
Wiseman Milk (semi)	.66	6	.62	92			.69	1			.55	3	***
Yoghurt													ns
Edam Cheese (Cheddar)	4.43	7	4.51	7							4.16	4	ns
Class 1Eggs	.77	4	.61	40	.68	12	.65	3	.61		.75	3	***
Class 1 Potatoes (new)	.29	6	.30	12			.24	12			.49	3	ns
Class 1 Potatoes (old)	.16	6	.18	26			.14	18			.12	3	ns
McCain's Straight Chips (frozen)	1.15	4	1.43	10									***
Class 1 Cabbage	.49	1	.39	6			.33	13			.35	3	ns

Class 1 Lettuce (iceberg)	.79	1	.70	11			.68	18		.69	3	ns
Class 1 Carrots	.28	6	.24	15			.21	18		.25	3	*
Class 1 Cucumber	.39	5	.57	12			.55	18		.79	3	***
Class 1 Tomatoes (fresh)	.59	5	.70	24			.67	20		.69	3	ns
Class 1 Onions	.28	6	.29	22			.23	18				*
Heinz Baked Beans	.36	9	.36	70	.35	1	.37	1		.37	1	ns
Napolina Tomatoes (tinned)			.42	9								-
Bird's Eye Peas (frozen)	1.29	4	1.80	5								*
Class 1 Oranges	.23	6	.23	24			.18	19		.29	3	***
Class 1 Apples	.51	6	.67	22			.64	18		.59	3	*
Class 1 Bananas	.56	6	.53	20			.46	19		.59	3	**
Sultanas												
Del Monte Orange Juice	.79	1	.83	12			.79	1		1.29	3	***
Class 1 Pears	.49	5	.57	5			.44	15		.39	3	***
Tate & Lyle Sugar	.74	9	.82	67						.79	1	***
Strawberry Jam	.87	4	.88	36								ns
Homepride Flour	.64	5	.81	25								*

PG Tips Tea Bags	1.59	4	1.82	14			1.99	1	***
Nescafe Instant Coffee	1.97	9	2.11	64	1.85	1	2.71	4	***
Cadbury's Drinking Choc	1.05	5	1.03	7	.99	1			ns
Heinz Soup (tomato)	.50	9	.47	79					**
Coca-Cola	1.27	9	1.28	74	1.29	1	1.17	1	ns
Cadbury's Chocolate Bar (sml)	.27	9	.27	84	.29	1			ns

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table I Mean price difference between the least and most expensive food items by shop type (independent stores)

Food Item	Affiliated Indpndnt		Indpndnt Grocer		Butcher		Fruit & Veg		Baker		Fish'mngr		Deli.		Signif.
	£	N	£	N	£	N	£	N	£	N	£	N	£	N	
White Sliced (lge)	.21	9	.11	83			.00	1	.11	14			.00	1	ns
White unsliced (sml)	.10	3	.00	4					.11	15			.00	1	*
White Baps	.00	5			.00	1	.01	15					.00	1	ns
Wh'meal Sliced (lge)	.18	9	.26	34			.23	1	.28	12			.31	1	*
Wh'meal Sliced (sml)	.00	9	.00	34			.00	1	.08	13			.00	1	***
Cornflakes	.07	9	.07	56			.00	1					.00	1	ns
Wheat Cereal Biscuits	.03	9	.00	44			.00	1							*
Spaghetti (dried)	.00	9	.04	44									1.30	1	***
Spaghetti (tinned)	.02	9	.00	63			.00	1							***
Jam Tarts	.00	1	.00	7					.00	4					-
Digestive Bisc'ts (plain)	.13	9	.00	72											***
Digestive Bisc'ts (choc)	.20	9	.02	70											***
Teacakes			.00	10					.00	5					-
Beef (topside)			.00	1	1.09	21									ns
Beef (mince)			.17	1	1.22	24									ns
Bacon (str'ky)	.00	9	.00	22	.12	23	.00	1					.00	3	ns
Chicken					.00	8							.00	3	-
Sausages	.22	9	.02	37	.24	23	.00	1							**
Burgers	.09	4	.00	27	.00	14									***
Cod Fillets					.00	1					.13	7			ns
Tuna (tinned)	.08	9	.01	67			.00	1					.00	1	***

Fish Fingers	.00	9	.18	20									ns
Butter	.14	9	.11	55							.12	4	ns
Margarine	.30	9	.27	54							.00	1	ns
Vegetable Oil	.03	9	.08	37	.00	1							ns
Milk (full)	.00	9	.00	93			.00	1			.00	3	ns
Milk (semi)	.00	9	.00	93			.00	1			.00	3	ns
Yoghurt	.11	9	.03	32							.10	4	**
Cheese (Cheddar)	2.38	9	.25	53			.00	1			3.13	4	***
Eggs	.00	4	.00	41	.00	12	.00	3	.00	1	.00	3	ns
Potatoes (new)	.00	6	.00	12			.00	13			.00	3	-
Potatoes (old)	.00	6	.00	26			.00	18			.03	3	***
Chips (frozen)	.00	4	.00	10									-
Cabbage	.00	1	.00	6			.04	14			.24	3	***
Lettuce (iceberg)	.00	1	.04	13			.07	19			.00	3	ns
Carrots	.00	6	.00	15			.00	18			.00	3	-
Cucumber	.00	5	.00	12			.00	18			.00	3	-
Tomatoes (fresh)	.00	5	.01	25			.03	20			.10	3	**
Onions	.00	6	.00	23			.00	18					-
Baked Beans	.00	9	.02	71	.00	1	.00	1			.00	1	ns
Tomatoes (tinned)	.00	9	.03	29			.00	1			.00	1	ns
Peas (frozen)	.00	4	.00	5									-
Oranges	.00	6	.00	24			.00	19			.00	3	-
Apples	.17	6	.03	31			.09	20			.30	3	***
Bananas	.00	6	.00	23			.00	19			.00	3	-
Sultanas	.00	5		.00	12								-
Orange Juice	.00	9	.04	51	.04	51			.00	2	.00	4	ns
Pears	.00	5	.01	6			.03	15			.30	3	***
Sugar	.00	9	.00	67	.00	1					.00	1	-
Jam	.04	9	.04	42							.00	1	ns
Flour	.00	5	.04	34									*

Tea Bags	.93	9	.57	55	.00	1	.00	1		.00	4	ns
Instant Coffee	.90	.9	.58	67	.00	1	.44	1		.00	4	-
Drinking Choc	.00	5	.00	8			.00	1				***
Soup (tomato)	.13	9	.00	79						.36	4	***
Cola	.45	9	.03	75			.00	1		.00	1	ns
Chocolate	.08	9	.07	87			.06	1				ns

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.)

Table J Availability of food items in the survey sample by shop type

Food Item	Multiple % (n)	Discounter % (n)	Freezer Store % (n)	Affiliated Indpndnt % (n)	Indpndnt Grocer % (n)	Butcher % (n)	Fruit & Veg % (n)	Baker % (n)	Fish'mngr % (n)	Deli. % (n)	Signif.
White Sliced (lge)	100 (39)	100 (25)	72.7 (8)	100 (9)	86.5 (83)	n/a	5 (1)	93.3 (14)	n/a	25 (1)	***
White unsliced (sml)	64.1 (25)	0 (0)	0 (0)	33.3 (9)	4.2 (4)	n/a	n/a	100 (15)	n/a	25 (1)	***
White Baps	66.7 (26)	28 (7)	0 (0)	55.6 (5)	43.8 (42)	n/a	5 (1)	100 (15)	n/a	25 (1)	***
Wh'meal Sliced (lge)	100 (39)	100 (39)	72.7 (8)	100 (9)	71.9 (69)	n/a	5 (1)	93.3 (14)	n/a	25 (1)	***
Wh'meal Sliced (sml)	97.4 (38)	100 (25)	72.7 (8)	100 (9)	40.6 (49)	n/a	5 (1)	86.7 (13)	n/a	25 (1)	***
Cornflakes	100 (39)	100 (25)	72.7 (8)	100 (9)	0 (0)	n/a	5 (1)	n/a	n/a	25 (1)	***
Wheat Cereal Biscuits	97.4 (38)	100 (25)	72.7 (8)	100 (9)	47.9 (46)	n/a	5 (1)	n/a	n/a	0 (0)	***
Spaghetti (dried)	100 (39)	100 (25)	0 (0)	100 (9)	47 (49)	n/a	n/a	n/a	n/a	25 (1)	***
Spaghetti (tinned)	100 (39)	100 (39)	27.3 (3)	100 (9)	65.6 (63)	n/a	5 (1)	n/a	n/a	0 (0)	***
Jam Tarts	35.9 (14)	4 (1)	72.7 (8)	11.1 (1)	7.3 (7)	n/a	n/a	26.7 (4)	n/a	0 (0)	***
Digestive Bisc'ts (plain)	100 (39)	100 (25)	72.7 (8)	100 (9)	77.1 (74)	n/a	n/a	n/a	n/a	0 (0)	***
Digestive Bisc'ts (choc)	94.9 (37)	100 (25)	72.7 (8)	100 (9)	74 (71)	n/a	n/a	n/a	n/a	0 (0)	***
Teacakes	17.9 (7)	0 (0)	0 (0)	0 (0)	0 (0)	n/a	n/a	33.3 (5)	n/a	0 (0)	**
Beef (topside)	64.1 (25)	72 (18)	0 (0)	0 (0)	0 (0)	87.5 (21)	n/a	n/a	n/a	0 (0)	***
Beef (mince)	97.4 (38)	72 (18)	72.7 (8)	0 (0)	1 (1)	100 (24)	n/a	n/a	n/a	0 (0)	***
Bacon (str'ky)	100 (39)	72 (18)	72.7 (8)	100 (9)	22.9 (22)	95.8 (23)	5 (1)	n/a	n/a	0 (0)	***
Chicken	97.4 (38)	100 (7)	0 (0)	0 (0)	0 (0)	33.3 (8)	n/a	n/a	n/a	75 (3)	***
Sausages	100 (39)	100 (25)	72.7 (8)	100 (9)	38.5 (37)	95.8 (23)	5 (1)	n/a	n/a	0 (0)	***
Burgers	97.4 (38)	100 (25)	100 (11)	44.4 (4)	28.1 (27)	58.3 (14)	n/a	n/a	n/a	0 (0)	***
Cod Fillets	43.6 (17)	0 (0)	0 (0)	0 (0)	0(0)	4.2 (1)	n/a	n/a	100 (7)	0 (0)	***
Tuna (tinned)	97.4 (38)	100 (25)	100 (11)	100 (9)	69.8 (67)	n/a	5 (1)	n/a	n/a	25 (1)	***

Fish Fingers	97.4 (38)	100 (25)	100 (11)	100 (9)	20.8 (20)	n/a	n/a	n/a	n/a	0 (0)	***
Butter	100 (39)	100 (25)	72.7 (8)	100 (9)	57.3 (55)	n/a	n/a	n/a	n/a	100 (4)	***
Margarine	100 (39)	100 (25)	72.7 (8)	100 (9)	56.3 (54)	n/a	n/a	n/a	n/a	25 (1)	***
Vegetable Oil	97.4 (38)	100 (25)	72.7 (8)	100 (9)	38.5 (37)	4.2 (1)	n/a	n/a	n/a	0 (0)	***
Milk (full)	100 (39)	100 (39)	100 (11)	100 (9)	96.9 (93)	n/a	5 (1)	n/a	n/a	75 (3)	***
Milk (semi)	100 (39)	100 (25)	100 (11)	100 (9)	96.9 (93)	n/a	5 (1)	n/a	n/a	75 (3)	***
Yoghurt	100 (39)	100 (25)	0 (0)	100 (9)	34.4 (33)	n/a	n/a	n/a	n/a	100 (4)	***
Cheese (Cheddar)	100 (39)	100 (25)	72.7 (8)	100 (9)	56.3 (54)	n/a	5 (1)	n/a	n/a	100 (4)	***
Eggs	100 (39)	100 (25)	100 (11)	44.4 (4)	42.7 (41)	50 (12)	15 (3)	6.7 (1)	n/a	75 (3)	***
Potatoes (new)	97.4 (38)	100 (25)	0 (0)	66.7 (6)	12.5 (12)	n/a	65 (13)	n/a	n/a	75 (3)	***
Potatoes (old)	97.4 (38)	28 (7)	0 (0)	66.7 (6)	27.1 (26)	n/a	90 (18)	n/a	n/a	75 (3)	***
Chips (frozen)	97.4 (38)	100 (25)	100 (11)	44.4 (4)	10.4 (10)	n/a	n/a	n/a	n/a	0 (0)	***
Cabbage	94.9 (37)	96 (24)	0 (0)	11.1 (1)	6.3 (6)	n/a	70 (14)	n/a	n/a	75 (3)	***
Lettuce (iceberg)	97.4 (38)	100 (25)	9.1 (1)	11.1 (1)	13.5 (13)	n/a	95 (19)	n/a	n/a	75 (3)	***
Carrots	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	15.6 (15)	n/a	90 (18)	n/a	n/a	75 (3)	***
Cucumber	97.4 (38)	100 (25)	9.1 (1)	55.6 (5)	12.5 (12)	n/a	90 (18)	n/a	n/a	75 (3)	***
Tomatoes (fresh)	97.4 (38)	100 (25)	9.1 (1)	55.6 (5)	26 (25)	n/a	100 (20)	n/a	n/a	75 (3)	***
Onions	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	24 (23)	n/a	90 (18)	n/a	n/a	0 (0)	***
Baked Beans	97.4 (38)	100 (25)	100 (11)	100 (9)	74 (71)	4.2 (1)	5 (1)	n/a	n/a	25 (1)	***
Tomatoes (tinned)	97.4 (38)	100 (25)	72.7 (8)	100 (9)	30.2 (29)	n/a	5 (1)	n/a	n/a	25 (1)	***
Peas (frozen)	97.4 (38)	96 (24)	72.7 (8)	44.4 (4)	5.2 (5)	n/a	n/a	n/a	n/a	0 (0)	***
Oranges	97.4 (38)	76 (19)	9.1 (1)	66.7 (6)	25 (24)	n/a	95 (19)	n/a	n/a	75 (3)	***
Apples	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	32.3 (31)	n/a	100 (20)	n/a	n/a	75 (3)	***
Bananas	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	24 (23)	n/a	95 (19)	n/a	n/a	75 (3)	***
Sultanas	94.9 (37)	4 (1)	0 (0)	55.6 (5)	15.6 (15)	n/a	0 (0)	n/a	n/a	0 (0)	***
Orange Juice	100 (39)	100 (25)	100 (11)	100 (9)	53.1 (51)	n/a	10 (2)	n/a	n/a	100 (4)	***
Pears	97.4 (38)	96 (24)	9.1 (1)	55.6 (5)	6.3 (6)	n/a	75 (15)	n/a	n/a	75 (3)	***
Sugar	97.4 (38)	100 (25)	100 (11)	100 (9)	69.8 (67)	4.2 (1)	n/a	n/a	n/a	0 (0)	***
Jam	92.3 (36)	100 (25)	72.7 (8)	100 (9)	43.8 (42)	n/a	n/a	n/a	n/a	25 (1)	***
Flour	94.9 (37)	100 (25)	72.7 (8)	55.6 (5)	35.4 (34)	n/a	n/a	n/a	n/a	0 (0)	***

Tea Bags	97.4 (38)	100 (25)	100 (11)	100 (9)	57.3 (55)	4.2 (1)	5 (1)	n/a	n/a	100 (4)	***
Instant Coffee	97.4 (38)	100 (25)	100 (11)	100 (9)	69.8 (67)	4.2 (1)	5 (1)	n/a	n/a	100 (4)	***
Drinking Choc	94.9 (37)	100 (25)	72.7 (8)	55.6 (5)	8.3 (8)	n/a	5 (1)	n/a	n/a	0 (0)	***
Soup (tomato)	100 (37)	100 (25)	72.7 (8)	100 (9)	82.5 (80)	n/a	n/a	n/a	n/a	100 (4)	***
Cola	97.4 (38)	100 (25)	100 (11)	100 (9)	81.3 (78)	n/a	5 (1)	n/a	n/a	25 (1)	***
Chocolate	100 (39)	76 (19)	72.7 (8)	100 (9)	90.6 (87)	n/a	5 (1)	n/a	n/a	0 (0)	***

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$)

(n/a = food items which these shop types would not normally stock)

Table K Availability of branded food items by shop type

Food Item	Multiple % (n)	Discounter % (n)	Freezer Store % (n)	Affiliated Indpndnt % (n)	Indpndnt Grocer % (n)	Butcher % (n)	Fruit & Veg % (n)	Baker % (n)	Fish'mngr % (n)	Deli. % (n)	Signif.
Kingsmill White Sliced (lge)	64.1 (25)	72 (18)	72.7 (8)	66.7 (6)	53.1 (51)	n/a	5 (1)	6.7 (1)	n/a	0 (0)	ns
Allinsons Wh'meal Sliced (lge)	64.8 (25)	0 (0)	72.7 (8)	100 (9)	45.8 (44)	n/a	5 (1)	20 (3)	n/a	0 (0)	***
Hovis Wh'meal Sliced (sml)	83.8 (31)	4 (1)	0 (0)	100 (9)	29.2 (28)	n/a	5 (1)	7.1 (1)	n/a	0 (0)	***
Kellogs Cornflakes	97.4 (38)	72 (18)	0 (0)	100 (9)	51 (49)	n/a	5 (1)	n/a	n/a	25 (1)	***
Weetabix	97.4 (38)	72 (18)	0 (0)	100 (9)	43.8 (42)	n/a	5 (1)	n/a	n/a	0 (0)	***
Marshalls Spaghetti (dried)	61.5 (24)	0 (0)	0 (0)	55.6 (5)	13.5 (13)	n/a	n/a	n/a	n/a	0 (0)	***
Heinz Spaghetti (tinned)	97.4 (38)	72 (18)	0 (0)	100 (9)	65.6 (63)	n/a	5 (1)	n/a	n/a	0 (0)	***
Jam Tarts	5.1 (2)	0 (0)	0 (0)	0 (0)	1 (1)	n/a	n/a	n/a	n/a	0 (0)	ns
McVities Digestive Biscuits (plain)	97.4 (38)	72 (18)	0 (0)	100 (9)	71.9 (69)	n/a	n/a	n/a	n/a	0 (0)	ns
McVities Digestive Biscuits (choc)	92.3 (36)	72 (18)	72.7 (8)	100 (9)	72.9 (70)	n/a	n/a	n/a	n/a	0 (0)	ns
Sunblest	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	n/a	n/a	n/a	n/a	0 (0)	

Teacakes											
Hall's Sausages	?								n/a		
Birds Eye Beefburgers	97.4 (38)	72 (18)	72.7 (8)	44.4 (4)	27.1 (26)	n/a	n/a	n/a	n/a	0 (0)	***
Cod Fillets						n/a	n/a	n/a	n/a		
Princes' Tinned Tuna	94.9 (37)	72 (18)	72.7 (8)	11.1 (1)	68.8 (66)	n/a	5 (1)	n/a	n/a	0 (0)	***
Bird's Eye Fish Fingers	69.2 (27)	0 (0)	72.7 (8)	100 (9)	19.8 (19)	n/a	n/a	n/a	n/a	0 (0)	***
Anchor Butter	97.4 (38)	72 (18)	72.7 (8)	100 (9)	33.3 (32)	n/a	n/a	n/a	n/a	25 (1)	***
Flora Margarine	97.4 (38)	72 (18)	72.7 (8)	100 (9)	45.8 (44)	n/a	n/a	n/a	n/a	0 (0)	***
Vegetable Oil	97.3 (36)	100 (25)	62.5 (5)	100 (9)	15.6 (15)	n/a	n/a	n/a	n/a	0 (0)	***
Wiseman Milk (full)	15.4 (6)	72 (18)	100 (11)	66.7 (6)	94.8 (91)	n/a	5 (1)	n/a	n/a	75 (3)	***
Wiseman Milk (semi)	82.1 (32)	72 (18)	100 (11)	100 (9)	95.8 (92)	n/a	5 (1)	n/a	n/a	75 (3)	***
Yoghurt	0 (0)	0 (0)	88.9 (8)	19.8 (19)	0 (0)	n/a	n/a	n/a	n/a	100 (4)	***
Edam Cheese (cheddar)	87.2 (34)	100 (25)	72.7 (8)	88.9 (8)	9.4 (9)	n/a	n/a	n/a	n/a	100 (4)	***
Class 1 Eggs	97.3 (36)	96 (24)	100 (11)	44.4 (4)	37.5 (36)	41.7 (10)	15 (3)	n/a	n/a	75 (3)	***
Class 1 Potatoes (new)	97.4 (38)	28 (7)	0 (0)	66.7 (6)	27.1 (26)	n/a	90 (18)	n/a	n/a	75 (3)	***
Class 1 Potatoes (old)	97.4 (38)	28 (7)	0 (0)	66.7 (6)	27.1 (26)	n/a	90 (18)	n/a	n/a	0 (0)	***
McCain's Straight Chips (frozen)	82.1 (32)	0 (0)	72.7 (8)	44.4 (4)	10.4 (10)	n/a	n/a	n/a	n/a	0 (0)	***
Class 1 Cabbage	94.9 (37)	96 (24)	0 (0)	11.1 (1)	6.3 (6)	n/a	65 (13)	n/a	n/a	75 (3)	***
Iceberg Lettuce	97.4 (38)	100 (25)	9.1 (1)	11.1 (1)	11.5 (11)	n/a	90 (18)	n/a	n/a	75 (3)	***
Class 1	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	15.6 (15)	n/a	90 (18)	n/a	n/a	75 (3)	***

Carrots											
Class 1 Cucumber	97.4 (38)	100 (25)	9.1 (1)	55.6 (5)	12.5 (12)	n/a	90 (18)	n/a	n/a	75 (3)	***
Class 1 Tomatoes	97.4 (38)	100 (25)	9.1 (1)	55.6 (5)	25 (24)	n/a	100 (20)	n/a	n/a	0 (0)	***
Class 1 Onions	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	22.9 (22)	n/a	90 (18)	n/a	n/a	0 (0)	***
Heinz Baked Beans	97.4 (38)	72 (18)	72.7 (8)	100 (9)	72.9 (70)	4.2 (1)	5 (1)	n/a	n/a	25 (1)	***
Napolina Tomatoes (tinned)	94.9 (37)	0 (0)	0 (0)	0 (0)	9.4 (9)	n/a	n/a	n/a	n/a	0 (0)	***
Bird's Eye Peas (frozen)	97.4 (38)	72 (18)	72.7 (8)	44.4 (4)	4.2 (4)	n/a	n/a	n/a	n/a	0 (0)	***
Class 1 Oranges	97.4 (38)	76 (19)	9.1 (1)	66.7 (6)	25 (24)	n/a	95 (19)	n/a	n/a	75 (3)	***
Class 1 Apples	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	22.9 (22)	n/a	90 (18)	n/a	n/a	75 (3)	***
Class 1 Bananas	97.4 (38)	100 (25)	9.1 (1)	66.7 (6)	19.8 (19)	n/a	95 (19)	n/a	n/a	75 (3)	***
Sultanas	50 (2)	0 (0)	0 (0)	55.6 (5)	2.1 (2)	n/a	0 (0)	n/a	n/a	0 (0)	***
Del Monte Orange Juice	94.9 (37)	72 (18)	72.7 (8)	11.1 (1)	14.6 (14)	n/a	5 (1)	n/a	n/a	75 (3)	***
Class 1 Pears	97.4 (38)	96 (24)	9.1 (1)	55.6 (5)	5.2 (5)	n/a	75 (15)	n/a	n/a	75 (3)	***
Tate & Lyle Sugar	97.4 (38)	96 (24)	100 (11)	100 (9)	69.8 (67)	n/a	n/a	n/a	n/a	25 (1)	***
Hartley's Strawberry Jam	3.3 (1)	0 (0)	0 (0)	44.4 (4)	37.5 (36)	n/a	n/a	n/a	n/a	0 (0)	***
Homepride Flour	57.1 (20)	72 (18)	0 (0)	55.6 (5)	26 (25)	n/a	n/a	n/a	n/a	0 (0)	***
PG Tips Tea Bags	92.3 (36)	72 (18)	0 (0)	44.4 (4)	16.7 (16)	n/a	n/a	n/a	n/a	25 (1)	***

Nescafe Instant Coffee	97.4 (38)	72 (18)	72.7 (8)	100 (9)	66.7 (64)	n/a	5 (1)	n/a	n/a	100 (4)	***
Cadburys Drinking Chocolate	61.5 (24)	72 (18)	0 (0)	55.6 (5)	7.3 (7)	n/a	5 (1)	n/a	n/a	0 (0)	***
Heinz Soup (tomato)	97.3 (36)	72 (18)	72.7 (8)	100 (9)	82.5 (80)	n/a	n/a	n/a	n/a	0 (0)	***
Coca-Cola	97.4 (38)	0 (0)	72.7 (8)	100 (9)	77.1 (74)	n/a	5 (1)	n/a	n/a	25 (1)	***
Cadbury's Chocolate (sml)	94.9 (37)	72 (18)	72.7 (8)	100 (9)	87.5 (84)	n/a	5 (1)	n/a	n/a	0 (0)	***

(ns = non significant, * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$)

(n/a = food items which these shop types would not normally stock)