

# The cost of a healthy and sustainable diet – who can afford it?

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Urban food security in the context of environmental change is gaining prominence internationally as an important health equity concern. Issues of availability, accessibility and affordability of food within cities appear to becoming intensified by environmental change and the pressures arising from ongoing rapid urbanisation.<sup>1-4</sup> With more than half the world's population now living in cities and urban growth rates expected to climb exponentially in the coming decades, there are significant implications for urban food insecurity, population health and the environment.<sup>2</sup> There is growing scientific consensus that we must consider alternative food systems as sustainable solutions to environmental and social harm caused by food insecurity.<sup>5</sup>

Environmental change, specifically climate change, has affected the price and availability of food in Australia and other countries globally.<sup>2,4,6,7</sup> Australia, normally one of the world's largest grain exporters, has had to import grain twice in the past decade, due to severe drought.<sup>8</sup> The price of domestic fresh vegetables and fruit increased by 33% and 43% respectively between 2005 and 2007 due to the prolonged Australian drought and increased frequency of severe weather events.<sup>4</sup> The 2012 End Hunger report commissioned by Foodbank NSW highlighted that from 2003/04 to 2009/10, the overall price of food in Australia had increased 24% and contributions to the rise in cost include supply issues caused by recent cyclones, floods, and drought.<sup>9</sup>

## Abstract

**Objective:** Climate change is affecting the ability of food systems to provide sufficient nutritious and affordable foods at all times. Healthy and sustainable (H&S) food choices are important contributions to health and climate change policy efforts. This paper presents empirical data on the affordability of a food basket that incorporates principles of health and sustainability across different food sub-systems, socioeconomic neighbourhoods and household income levels in Greater Western Sydney, Australia.

**Methods:** A basket survey was used to investigate the cost of both a typical basket of food and a hypothetical H&S basket. The price of foods in the two baskets was recorded in five neighbourhoods, and the affordability of the baskets was determined across household income quintiles.

**Results:** The cost of the H&S basket was more than the typical basket in all five socioeconomic neighbourhoods, with most disadvantaged neighbourhood spending proportionately more (30%) to buy the H&S basket. Within household income levels, the greatest inequity was found in the middle income neighbourhood, showing that households in the lowest income quintile would have to spend up to 48% of their weekly income to buy the H&S basket, while households in the highest income quintile would have to spend significantly less of their weekly income (9%).

**Conclusion:** The most disadvantaged groups in the region, both at the neighbourhood and household level, experience the greatest inequality in affordability of the H&S diet.

**Implications:** The results highlight the current inequity in food choice in the region and the underlying social issues of cost and affordability of H&S foods.

**Key words:** food security, food affordability, dietary choice, climate change, health inequalities, sustainability, urban health

During that same period of food price increases, the disposable income of low economic resource households in Australia rose by 20%, drawing attention to household financial resources and food cost as important determinants of food security and diet-related health.<sup>9,10</sup> In recent years, neighbourhood contextual influences on diet-related health outcomes have become a focus of research.<sup>11-13</sup> The evidence suggests

that exposure to particular neighbourhood food environments influence food purchasing and consumption behaviours. Further, research in the United States points to an inverse relationship between energy density of foods, defined as available energy per unit weight (kilocalories per gram or megajoules per kilogram), and energy cost (dollars per kilocalorie or dollars per megajoule). Diets consisting of energy dense or 'discretionary'

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foods made up of refined grains, added sugars and added fats are often more affordable than the recommended diets based on lean meats, fish, fresh vegetables and fruit.<sup>14</sup> These factors are mediated by individual and household-level factors, including income and education and as a result contribute to inequities in diet-related health outcomes.<sup>12,15,13,16-18</sup> The reasons for food purchasing and consumption habits are undoubtedly complex; however, affordability of food is fundamental.<sup>19</sup>

As concern for food price grows, the importance of integrating environmental considerations into people's food choices is increasingly recognised as an important component of a policy response concerned with health, food security and environmental sustainability.<sup>5,20-22</sup> However, to date, no studies that we are aware of consider health and environmental principles when assessing food cost. The aim of this study was to compare and contrast the capacity of sub-systems to provide nutritious and affordable food in a sustainable way. The paper presents empirical data on the cost and affordability of a H&S food basket compared to a typical food basket across three food sub-systems for two-adult, two-child households living in five different socioeconomic neighbourhoods and quintiles of household income in Greater Western Sydney, Australia.

## Methods

### Basket development

In this study we expanded the traditional 'food basket' approach to include environmental considerations to create an environmentally friendly and healthy food basket. The food basket approach is one of the most commonly used and recognised methods for assessing and monitoring food availability and cost, both internationally<sup>17,23</sup> and within Australia.<sup>24-26</sup> Two baskets were developed – one reflecting a typical diet and one incorporating principles of health and environmental sustainability. A detailed description of each basket's development is described elsewhere.<sup>27</sup> Briefly, the typical food basket was constructed to reflect the weekly food purchasing of a hypothetical reference household, in this instance an adult male (aged 19–60 years), an adult female (aged 19–60 years), a boy aged 15 and a girl aged four. The H&S basket was constructed using an adapted version of the food items included in the typical food basket. The H&S

basket was developed first according to health principles and constructed around the conventional health focus of the Australian Dietary Guidelines.<sup>28</sup> Foods included in the H&S basket were selected in accordance with the three food choice categories listed in the *Australian Guide to Healthy Eating*: the five food groups category; the allowance for unsaturated spreads and oils category; and the discretionary food choices category. This method required that the basket contain the minimal number and variety of food serves recommended by the *Australian Guide to Healthy Eating* to meet the minimum recommended intake ranges for two healthy adults and two children. Food items were then chosen that had a lower environmental impact as identified in the Australian evidence base.<sup>29</sup>

### Selection of study region and sites

The costs of the typical and healthy and sustainable food baskets were determined in five locations across Greater Western Sydney (GWS). The study sites were selected from the 2006 Australian Bureau of Statistics' 2,544 Census Collection Districts (CD) in Greater Western Sydney.<sup>30</sup> The CDs were ranked by their Socio-Economic Index for Areas (SEIFA) score and divided into SEIFA quintiles. The median CD within each SEIFA quintile was selected for inclusion in the study. SEIFA index integrates indicators of both advantage (such as high income, high employment in professional/skilled occupations) and disadvantage (such as low income, high unemployment and low levels of education) in order to represent the entire social gradient. The five CDs selected for inclusion in the study are: Ingleburn (IB), Old Guildford (OG), St Clair (SC), Toongabbie (TG) and Quakers Hill (QH). Table 1 gives a summary of the five study sites.

### Selection of food provisioning outlets

Food provisioning outlets were classified according to the framework developed by

Mason and colleagues, following their review of urban agriculture and food sub-systems in GWS: industrial food systems (including supermarkets, large and small grocery stores); alternative commercial systems (including food cooperatives, farmers markets and other markets); and civic systems based on community and school gardens.<sup>31</sup>

Geographic information systems (GIS) techniques were used to spatially examine the physical access to different food provisioning outlets in each of the study sites. One of the most common approaches used in GIS food environment research is the identification of a physical boundary in which food outlets are located, and definition of a buffer zone or 'shopping catchment' around the geographic centroid.<sup>32</sup> We used a modified version of O'Dwyer and Coveney's accessibility index<sup>33</sup> to define three buffer zones in each collection district. The first and second buffers are based on a distance of 500 m and 2.5 km around the collection district geographic centroid for all the food sub-systems/outlets; the third buffer is 7 km around the centroid for alternative and civic food systems only. The geographic centroid of each collection district was calculated using data from ABS Geographical Classification Digital Boundary Files.<sup>34</sup>

Within each buffer zone, the presence, absence and type of nearby food outlets was determined by using GIS coordinate data and by conducting an online search using search engines such as Google, Yellow Pages and True Local. A crosscheck was conducted with a physical visit to each study site and civic providers were identified from key contacts and word of mouth.

### Conducting the survey

In November and December 2011, 82 unique food outlets were surveyed across the five CDs in Greater Western Sydney. The survey instrument was based on previous Australian food basket surveys.<sup>24,25,35</sup> The food items in the survey instrument represented the

Table 1: Study sites across Greater Western Sydney.

2006 Census Collection District (CD)	2006 Local Government Area	Usual Resident Population	SEIFA Quintile within GWS	Percentage unemployment
Ingleburn	Campbelltown	776	1 (disadvantage)	11.9
Old Guildford	Fairfield	874	2	10.1
St Clair	Penrith	1,073	3	5.5
Toongabbie	Holroyd	632	4	2.7
Quakers Hill	Blacktown	904	5 (advantage)	3.4

aggregate list of the foods in the typical and healthy and sustainable baskets. The survey instrument was used to record availability, price, weight, unit of measurement and price per unit weight for each food item. If the item was normally available (stocked), the cheapest price/brand of each food item was documented (excluding sale and bulk prices). Where weight per unit was not available weights were estimated using data available from the Food Standards for Australia and New Zealand ([www.foodstandards.gov.au](http://www.foodstandards.gov.au)).

### Data management and analysis

#### Food prices and basket cost

The price of food items was recorded from the industrial and alternative food outlets within the buffer zones of each collection district; no cost information was recorded from the civic outlets as these items were not available for purchase. The recorded price of each available food item was converted into price per unit weight (kilogram or millilitre), and then the price per required total weight for the food basket was calculated. If a food item was not available in the collection district, an average cost of that item was calculated from price data reported in other collection districts. The total cost of the food baskets in each CD was calculated by summing the average price per required weight of each food item in the basket.

#### Affordability

The affordability of the H&S basket and the typical basket was estimated based on the total cost of each basket relative to the average weekly disposable household income in each household income quintile within each of the CDs. The average household income information was obtained for couples with two dependent children at the NSW level.<sup>36</sup> The cost of each basket was expressed as a percentage of average disposable household income across the income quintiles and in each CD.

## Results

### Cost of the baskets across five levels of neighbourhood (dis)advantage in Greater Western Sydney

The average price of the H&S basket cost more than a typical basket in all five CDs in GWS, ranging from 4% to 30% more (Figure 1). The average cost of the H&S basket is highest in the middle SEIFA CD

(\$326.24), followed by the most advantaged area (\$313.39), and is lowest in SEIFA district 2 (\$267.70). The greatest proportionate difference in cost between the two baskets is in the most disadvantaged SEIFA collection district (30%).

### Affordability of the baskets across income quintiles and levels of neighbourhood (dis)advantage in GWS

Inequities exist in the affordability of the H&S basket and the typical basket at the household level (Figure 2). The lowest income quintile households would have to spend between 33% and 44% of their weekly income to buy a typical basket. The same households would have to spend between 40% and 48% of their weekly income to buy the H&S basket. By comparison, households in the highest income quintile would have to spend significantly less, between 6% and 8% for the typical basket, and between 8% and 9% for the H&S basket.

The neighbourhood with the highest cost of the H&S basket as a percentage of household income was in the middle SEIFA district 3. Within that neighbourhood, the lowest income quintile would have to spend up to 48% to buy the H&S basket. Households in the highest income quintile would have to spend significantly less (9%) of their weekly income. Importantly, the greatest percentage difference in affordability of the two baskets in the lowest household income quintile was in the most disadvantaged neighbourhood, SEIFA district 1 (10%) (Figure 2).

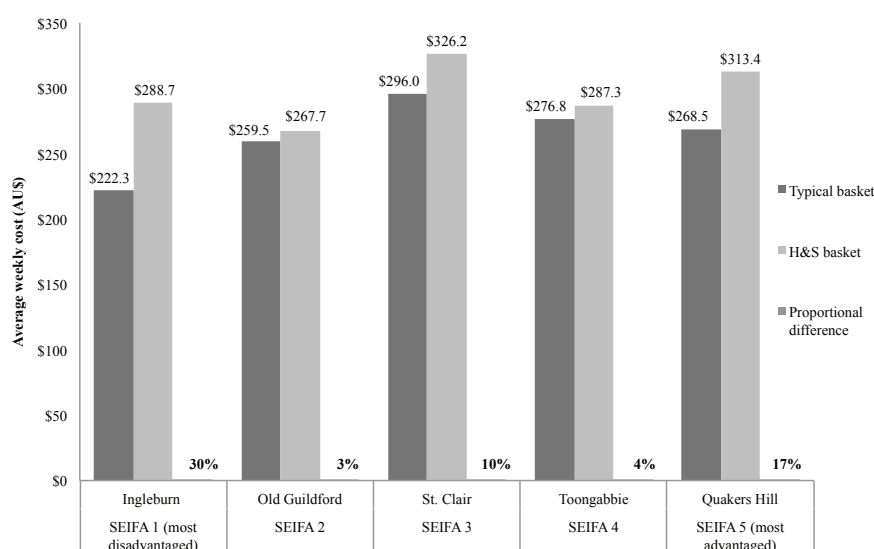
### Cost of food items across different types of food outlets

It is impossible to compare the cost of the complete food baskets between outlet type and location since the complete H&S basket was not available from every food outlet, particularly the alternative and small grocery stores. However, it is possible to compare specific food items. Overall, supermarkets are cheaper than smaller grocery and convenience stores, and alternative outlets are the least expensive outlets (Table 2). The cost of an apple is \$3.74/kg in the supermarkets, \$6.30/kg in the small grocery and convenient stores, and \$3.63/kg in the alternative outlets. A similar pattern is found with the healthy and sustainable fruit option (oranges). Similarly, the cost of the typical choice of meat (beef) was \$12.78/kg in the supermarkets and \$16.26/kg in the small grocery and convenient stores, and was least expensive in the alternative outlets (\$10.99/kg). The healthy and sustainable option (kangaroo) cost \$15.26/kg in the supermarkets.

## Conclusion

In an effort to investigate the cost and affordability of a healthy and environmentally sustainable diet, two hypothetical food baskets were developed and costed for a two-adult, two-children household in Greater Western Sydney, Australia. Our findings are consistent with other food environment research in Australia<sup>19,24-26,33,37,38</sup>

**Figure 1: Average cost of the H&S and Typical food baskets across five different levels of neighbourhood disadvantage, Greater Western Sydney, Australia.**



in that there is an overall tendency for food prices to be higher in the more advantaged neighbourhoods and lower in the more disadvantaged neighbourhoods. Importantly, the findings indicate that a two-adult, two-children household would need to spend more money in every neighbourhood surveyed to eat in a healthy and sustainable way. The most expensive neighbourhood in which to buy the H&S basket was in the middle SEIFA district 3, followed by the most advantaged SEIFA district 5, with the least expensive neighbourhood to buy the basket being in SEIFA district 2. However, in the most disadvantaged SEIFA collection district 1, the cost of purchasing the H&S basket compared to the typical basket is 30% more than in the other four neighbourhoods.

Having more or less of certain types of outlets contributes to the price of the baskets within each of the neighbourhoods. Tsang et al. pointed out that supermarket pricing policy varies by ownership and large, transnational companies can often set central prices and maintain these prices throughout a region.<sup>35</sup> Cole-Hamilton and Lang (1986) also highlighted that food bought in large supermarket chains tend to be more affordable than food in small, local shops [reference?]. In the current study, the middle and higher SEIFA ranked neighbourhoods had fewer supermarkets than lower SEIFA neighbourhoods. The absence of supermarkets and presence of smaller, individually owned stores in the middle and high neighbourhoods might have contributed to higher food costs in those neighbourhoods. For example, SEIFA 5 (most advantaged) had no major supermarket available and, as shown in Table 2, the H&S food items tend to cost less in supermarkets compared to smaller grocery and convenient stores. This is in contrast to SEIFA 1 (most disadvantaged) where two major supermarkets were surveyed/available, potentially driving down the basket price. It is important to highlight that although there were indeed more alternative markets available in the higher SEIFA districts, where prices were generally cheaper, the complete H&S basket was not as available from those outlets. If the presence of alternative outlets is to have an impact on the price of foods, the quality and quantity of foods available at those outlets needs to be considered.

Inequities also exist in the affordability of the H&S basket across the household income quintiles. Of concern are the large inequities

**Table 2: Average cost of selected food items in the major food groups, across three types of food provisioning sub-systems.**

Food group	Type of basket	Selected food item	Industrial: Supermarket (AU\$ per kg)	Industrial: Small grocery and convenient (AU\$ per kg)	Alternative (AU\$ per kg)
Vegetables	Typical	Zucchini	3.78	3.99	2.67
	H&S	Carrot	1.85	1.85	2.42
Fruit	Typical	Apple	3.74	6.30	3.63
	H&S	Orange	2.35	3.58	2.25
Grain (cereal) foods	Typical	White bread	2.23	3.55	2.21
	H&S	Whole-meal	3.64	4.03	2.62
Meats and poultry, fish, eggs, tofu, nuts, and seeds, legumes/beans	Typical	Beef	12.78	16.26	10.99
	H&S	Kangaroo	15.26	null	null
Milk, yoghurt, cheese and/or their alternatives	Typical	Cheese	9.69	23.37	null
	H&S	Yogurt	5.05	6.70	null

\*Industrial supermarkets (e.g. Coles, Woolworths, IGA, Aldi)

\*Industrial small grocery and convenient (e.g. bakery, butcher, green grocer)

\*Alternative (e.g. food cooperatives, farmers markets and artisan farms)

found in the proportion of weekly income that households in the lowest income quintile in all five neighbourhoods would need to spend to eat in a healthy and sustainable way. Again, when looking in the lowest income quintile, the highest cost relative to weekly income was identified in the middle SEIFA district 3 (48%), followed by SEIFA district 5 (46%), and was lowest in the SEIFA district 2 (40%). These figures are far above the 30% food expenditure cut-off for low-income households to remain in financial stability.<sup>10</sup> Notably, the greatest difference in the relative affordability of the two baskets in the lowest income quintile (10% of weekly income) was found in the most disadvantaged neighbourhood, SEIFA 1. These findings add to the body of evidence that cost and affordability are important determinants in influencing people's food choices. Clonan and Holdsworth (2012) have identified that sustainable and certified food items often cost more, and that cost is a recognised barrier to accessing a healthy and sustainable diet [reference?]. The authors further outline that it is vital that health and sustainability be incorporated into social dimensions of food choices, making it affordable for food production and consumption.<sup>39</sup> Davies also calls attention to the importance of cost as a determinant of food choices and highlights that until sustainable options become more affordable, people will continue to disregard environmental considerations when making food purchases.<sup>40</sup> The difference in the costing of the two food baskets, particularly in the lowest socioeconomic neighbourhood,

highlights the current inequity in food choice in Greater Western Sydney and the underlying social issues of cost and affordability of healthy and sustainable foods across the social gradient.

## Study limitations

The food basket approach lacks accuracy, as the reference household and basket items used are a proxy and not necessarily representative of the composition and dietary habits of all households in a neighbourhood, economic group or cultural group. Given the new concept of considering environmental impact of foods, there are limitations to the evidence on which we have based the development of the H&S basket. The H&S basket may not represent actual eating patterns as the basket was constructed using limited numbers of food items for which environmental impact analysis was available. However, with considered study design and adherence to best practice guidelines, the food basket survey approach is widely recognised as a reliable and valid technique for assessing food access.

Variability in food item selection may often introduce some bias.<sup>41</sup> Different studies have used different methods of selecting the food package sizes and brands for pricing. The method employed by this study has been criticised for not reflecting people's normal purchasing decisions and not accounting for differences in product quality. Also, it was not possible to take into account the contribution that the civic food provisioning



systems (in which foods are essentially free to those involved in the system) make to total consumption. It is important that these are taken into consideration in future discussions of the sustainability of food systems, and further research is necessary to determine the role they do (or could) play in improving access and affordability of H&S foods.

Nonetheless, our primary aim was to assess the difference in affordability of the H&S basket of food compared to a typical basket of food – a first of its kind. A further study is needed to systematically assess the difference of quality across different types of food outlets and neighbourhoods. In spite of these

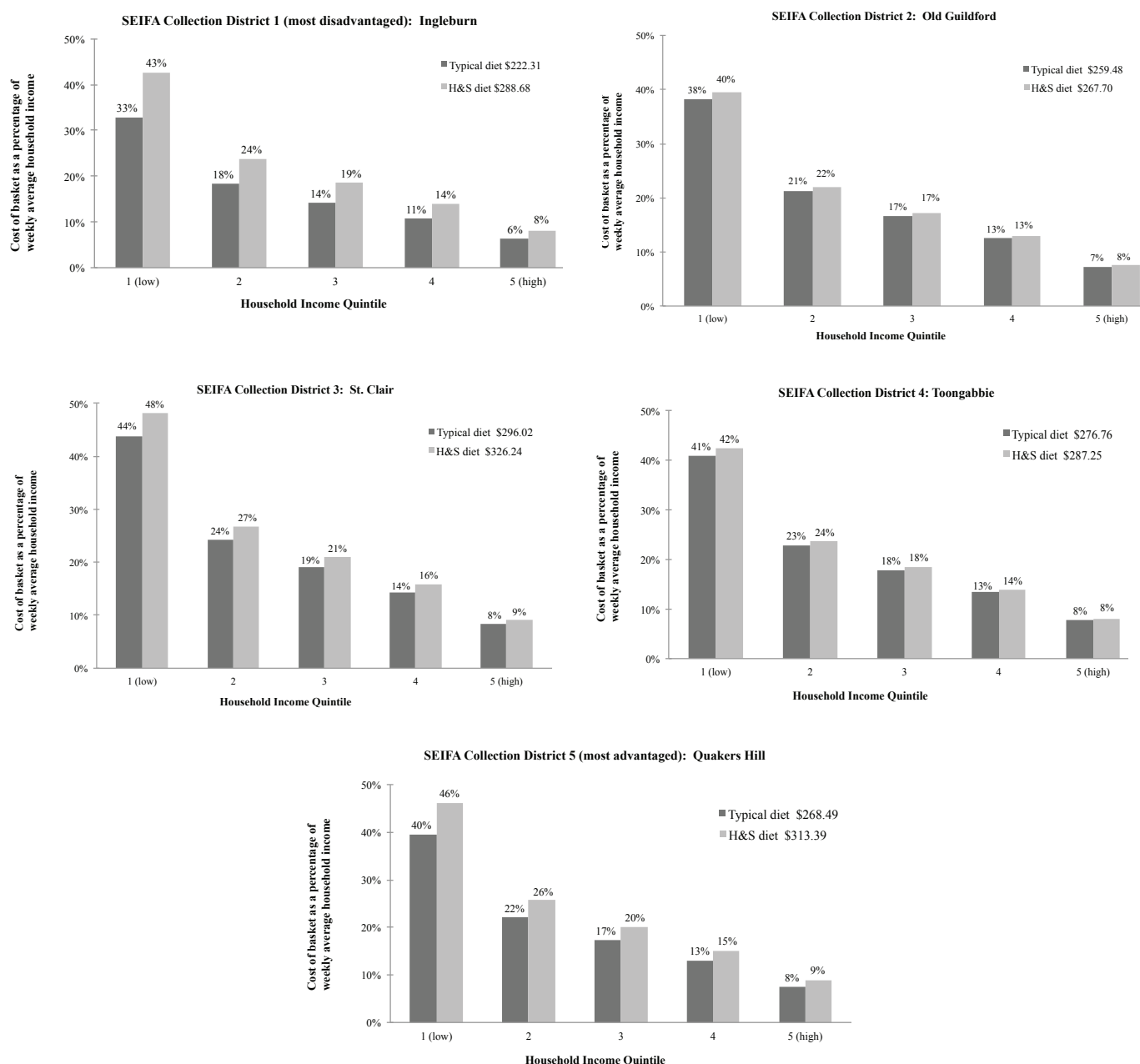
limitations, the findings of this study are broadly consistent with a wider literature on social inequalities and food insecurity.

The findings from this study pose a number of policy challenges. Policies and actions are needed that help ensure the ready availability of affordable healthy and sustainable food choices. Policy coherence is important. For example, action in the climate change policy arena, such as a carbon tax, could inadvertently drive up the price of food. In such a situation, social protection policies may be necessary to mitigate any negative impact on the affordability of foods.

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**Figure 2: Cost of the Typical and H&S basket as a percentage of weekly mean household income, by household income quintile and level of neighbourhood disadvantage.**



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