

## DETERMINING THE AVAILABILITY OF, AND ACCESS TO, FRESH FRUIT AND VEGETABLES IN ARCADIA AND EASTWOOD, PRETORIA

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### ABSTRACT

Research shows that food choices are affected by the food environment. Similarly, the presence of fruit and vegetables in the home results in greater fruit and vegetable consumption by children. A *food desert* is an area without ready access to fresh, healthy, and affordable food, even though it may have food outlets. The main aim of public transport planning is to simplify the accessibility to facilities and services, such as one's working place, shops, restaurants, clinics, visiting friends, etc. The use of a geographical information system (GIS) may help to identify spatial inequalities in access to healthy food, and help urban planners modify the food environment accordingly. Poor availability and accessibility of fresh fruit and vegetables in shops is associated with lack of dietary diversity, under-nutrition and obesity.

This study combined both field work in the suburbs of Arcadia and Eastwood in Pretoria, and data analysis to investigate access to retail outlets (formal and informal) and the availability of fresh fruit and vegetables. The study also considered the various modes of transport available, walking distances carrying shopping, and population densities and characteristics. The availability of fresh fruit and vegetables in retail outlets was measured by a simple classification of fruit and vegetables. Transport nodes, transport frequency and buffering were used to determine accessibility.

Based on the literature and personal experience, an acceptable walking distance of 400m was used. A large number of the households are within an acceptable walking distance of food shops, bus-stops and/or taxi routes. Further, there is a high level of car ownership in the remaining parts of the study area, which is also a good indicator of accessibility to shops. There are several shops (formal and informal) that sell a variety of fruit and vegetables in the study area. Our results show that shops with fruit and vegetables are moderately available in the study area. Future research should investigate the link between the food environment and actual food behaviours in this area.

### BACKGROUND

Arcadia and Eastwood are adjacent suburbs in Pretoria, South Africa, that are known for their historical buildings, embassies, hotels, the Union Buildings and the official residence of South Africa's President. They form a convenient study area because they are bounded by the ridge of the Magaliesberg to the north, schools (Pretoria High School for Girls, Pretoria Technical High and Boston College) and the University of Pretoria to the south, and retail and commercial areas of Pretoria Central to the west and Hatfield to the east. They also have a wide range of types of dwellings, from

the affluent one would expect near the President's residence, to small flats used by young workers and students dependent on very limited loans through the National Student Financial Aid Scheme(NSFAS). The study area is bisected by major thoroughfares running east-west, namely Stanza Bopape Street (formerly Church Street), Pretorius Street, Francis Baard Street (formerly Schoeman Street) and Park Street. See Figure 1 for an overview of the study area.

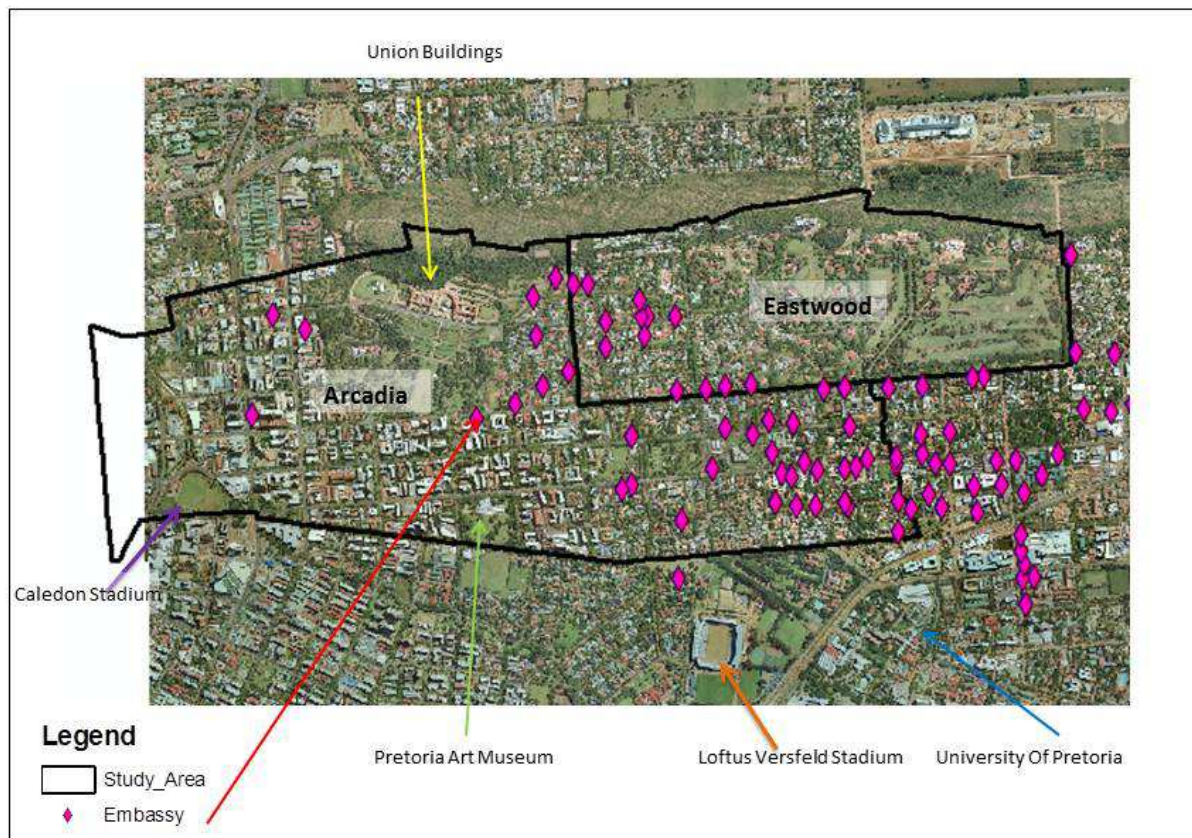


Figure 1. The study area

Food environments are complex and multi-level. Market-based factors, consumer preferences and cultural foods all play important roles in food environments and changes in policies can lead to changes in food environments (Glanz, 2009). A **food desert** is an area without ready access to fresh, healthy and affordable food, even though it may have food outlets. Food deserts may damage public health by limiting the availability and affordability of foods that may benefit health and reports about them have influenced policies planned to promote adequate provision of food for those with low incomes and improve shopping access in such areas (Cummins & Macintyre, 2002).

Much of the research on food deserts and action to combat them to date has been done in developing countries, such as the United States of America. There, for example, First Lady Obama has launch an attack on food deserts to help bring down childhood obesity: *"We can give people all the information and advice in the world about healthy eating and exercise, but if parent can't buy the food they need to prepare those meals because their only options for groceries are the gas station or the local minimart, then all that is just talk"* (Office of the First Lady, 2011).

Our research aimed at understanding a food environment in a developing country such as South Africa, using Arcadia and Eastwood as a case study. It is difficult to obtain reliable food intake data, because of factors such as portion sizes, number of servings, food and food groups consumed, identifying foods, new foods, and mixed dishes (Faber *et al*, 2013), as well as store size and layout

(Apparicio *et al*, 2007; Bodor *et al*, 2007). Hence, our study aimed at determining the availability and accessibility of fresh fruits and vegetables in the area. Factors such as the accessibility of food retail outlets (including informal street traders), the availability of fresh fruits and vegetables at them, transport, and the maximum distance that one can walk comfortably with full grocery bags were investigated.

Our research did not aim at determining whether or not there is a food desert in the study area, but rather at assessing different characteristics that could indicate the presence or absence of a food desert in a developing country such as South Africa. It is not possible merely to apply the methodologies used in developed countries because of the very different geographical, social and other conditions here, such as the nature of available transport, with private minibus taxis predominating in South Africa. Even then, researchers found significant differences in North American cities such as Edmonton (Smoyer-Tomic *et al*, 2006), Montréal (Apparicio *et al*, 2007) and New Orleans (Bodor *et al*, 2007), because of their different geographies. Our research on food environments is continuing, studying other areas in Tshwane and other factors.

### FOOD ENVIRONMENTS

Geographical information systems (GIS) are useful for measuring physical accessibility and have been applied in many areas, such as retail site analysis, transport, emergency service and health care planning (Black *et al*, 2004). Modelling travel times, transportation networks and modes, and travel routing behaviours has been done by others to assess food-outlet spatial accessibility between different types of neighbourhoods or investigate relationships between the characteristics of the food environment and individual food behaviour. This may help to identify spatial inequalities in access to food outlets and assist planners modify the food environment accordingly.

Food choice, particularly by young people, is strongly affected by the food that is freely available in their home environment. For example, the presence of fruits and vegetables in a home has been associated with greater fruit and vegetable consumption by children (Van der Horst *et al*. 2007). Fruit and vegetable consumption is also higher in homes where products are made easily accessible, such as by peeling and slicing carrots and storing them in the refrigerator (Cullen *et al*, 2003).

In research in New-York City, researchers collected data about food shops, food availability and prices of healthy and unhealthy food, block by block. To calculate accessibility, they used a distance of a quarter of a mile (about 400 metres), because the literature suggested people are willing to walk for about five minutes to reach neighbourhood shops and services, which is that distance (Gordon *et al*, 2011). The first author lives in our study area and she conducted field trials to determine a reasonable distance for accessibility, by walking carrying different amounts of groceries. She found that the comfortable walking distance for her was also about 400 metres. This then confirmed that it is a reasonable distance to use for determining accessibility. Distances used for accessibility vary significantly in the literature: Bodor *et al* (2007) used a distance of 100 metres, because it is about the length of a city block, while Apparicio *et al* (2007) considered a distance of 1000 metres to be walkable. Smoyer-Tomic *et al* (2006) used 1000 metres, because too many of the neighbourhoods in their study lacked a supermarket within 800 metres.

“Access to healthy food means that the food is available and affordable”, with availability defined as “the number of food-related outlets within a measured geographic area assessed on a per capita and/or a per land area basis” (Powell, 2009). This is also associated with the time cost of a convenience shop that is a five-minute walk away versus a supermarket that is a half-hour bus or taxi

ride away, with healthy foods being associated with grocery shops and supermarkets, and less-healthy foods with convenience shops and fast-food restaurants. The affordability of healthy foods can be represented by the prices of fruits and vegetables, while that of less-healthy foods by the prices of fast food and soft drinks (Whitacre *et al*, 2009).

The geography of a city and how food flows into both formal and informal shops impact on whether or not people can get sufficient good, nutritious food to be classified as food secure. One needs to consider the broader layout of the city and where food retail outlets are relative to poorer, often carless communities. Poorer areas tend to have fewer and smaller retail outlets (Alwitt & Doneley, 1997). Factors include the time spent traveling to the nearest food sources, social barriers and an individual's mobility, be it lugging groceries home on foot, or using busy taxis. However, this has not been well studied yet (Joubert, 2012). The type and size of the food outlet is important in determining the price and availability of food, with the small shops generally having smaller range of products and higher prices (Piachaud & Webb, 1996).

GISs provide a variety of applicable measuring techniques, such as food-outlet density using buffer distances, or proximity to the nearest outlet, but a challenge is determining suitable and constant criteria for defining boundaries (McKinnon *et al*, 2009; Charreire *et al*, 2010). Data on the availability of different types of foods can be gathered by conducting interviews or using questionnaires, or manually, by inspecting or reviewing the food outlets oneself to estimate variety, quantity, prices and other factors (Caspi *et al*, 2012).

Both under- and over-nutrition are evident in South Africa, between and within populations and across age groups (Steyn *et al*, 2006). There is also evidence that AIDS is having a significant effect on agriculture and food security in South Africa. It has been reported that millions of households in South Africa were undernourished because they did not have the opportunity to make healthy food choices (Cummins & Macintyre, 2002). "Residents of poor communities have blamed the lack of supermarkets in their areas as the main reason for not being able to eat more healthily" (Laurance, 1998). In 1992, the price and availability of baskets of more and less healthy foods, in both a more and a less deprived area, were studied and the researchers found that healthy food costs more in a poorer area than in a wealthier area and that the relative difference in cost between healthy food and unhealthy food was less in the wealthier area (Sooman *et al.*, 1993).

## FIELD WORK

In our study, the first author walked the study area to identify and map all the formal and informal food outlets in the study area (including filling stations, restaurants and hotels) and the public transport routes and stops. She also visited each food outlet to record the presence or absence of fruits and vegetables, be they fresh, frozen, canned, prepared salads or 100% juice. Figure 2 shows examples of the food availability that she found and photographed. Further, as discussed below, she obtained data on the frequency of minibus taxis.

These data were correlated with data available in the University of Pretoria's repository, online (including menus of restaurants and hotels) and from the City of Tshwane. Some of the data on public transport also had to be digitized from textual descriptions.

## TRANSPORT

“The main aim of public transport planning is to simplify the reachability of locations where passengers are able to perform activities such as working, shopping, visiting friends etc” (Glanz 2009). Two ways to measure accessibility are simple accessibility and integrated accessibility. The first concerns information about the transport system itself: transit stops, departure frequency, total net length, gaps between stops, number of interchange facilities, interchanging times, and/or the number of routes that can be used. Integrated accessibility is determined by the spatial distribution of potential destinations, the ease of reaching each destination, and the magnitude, quality and character of the activities found there (Schürmann et al., 1997; Wegener *et al.*, 2000; Schwarze 2005).

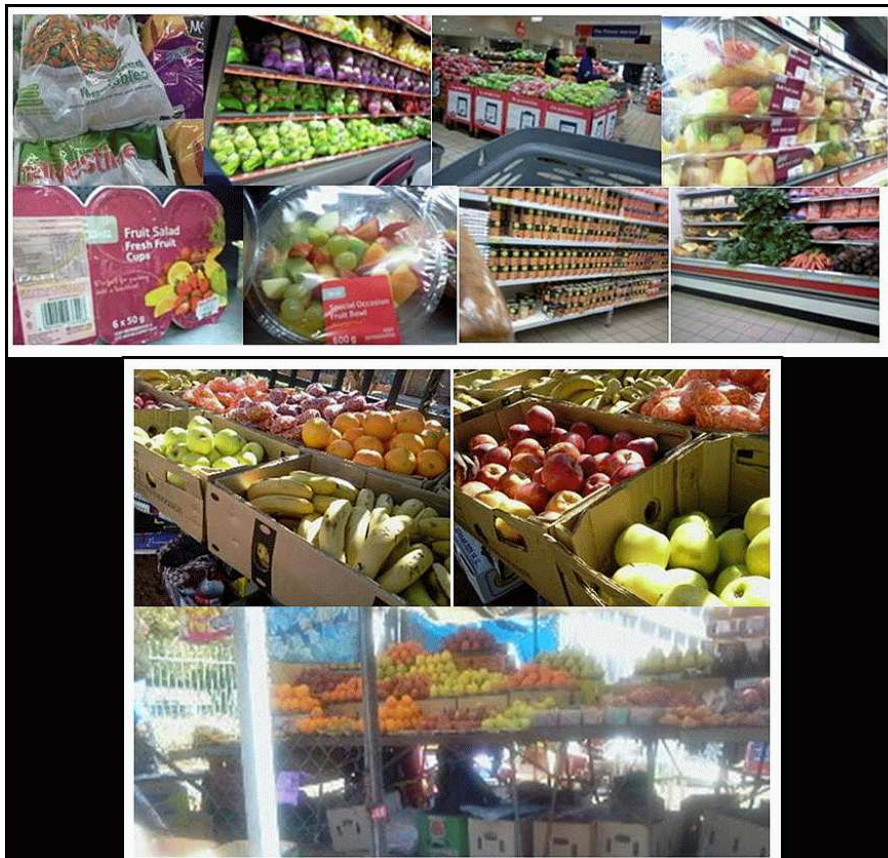


Figure 2. Fruit and vegetables in shops (above) and informal markets (below)

The modes of public transport available in Arcadia and Eastwood are metered-taxis, unmetered minibus taxis (designed to carry 9-18 seated persons, excluding the driver) and buses, which are designed to carry more than 35 seated persons, excluding the driver, and with designated stops (City of Tshwane Metropolitan Municipality, 2005). All should be licenced (though in our experience, unlicensed or pirate taxis are common) and while they do not have designated stops, the minibus taxis generally have designated routes, such as east-west across Arcadia along Stanza Bopape, Pretorius, Francis Baard and Park Streets. The first author conducted a sample survey of the availability of taxis on these four routes, counting them for five minutes at a time, three times a day, between 17 and 19 June 2013. This showed that the minibus taxis have high availability, as shown in Figure 3, with a peak of 54 taxis in one five-minute period!

Municipal buses serve Arcadia along these same east-west axes between 05:00 and 19:00. While conducting her survey of the minibus taxis, she noted that the buses were available as expected, according to their time tables. The Gautrain buses also run along Stanza Bopape and Park Streets, between 06:14 and 19:53, but only on work days. Hence, Arcadia is well served by public transport from early morning into the evening, while Eastwood is not. However, according to the 2011 Census (StatsSA, 2012), Arcadia then had a population of 23 404 people in 9 613 households, of which 36% own cars, while Eastwood then had a population of 947 people in 362 households, of which 77% own cars. Clearly, the need for public transport is greater in Arcadia than in Eastwood, though Eastwood has no shops.

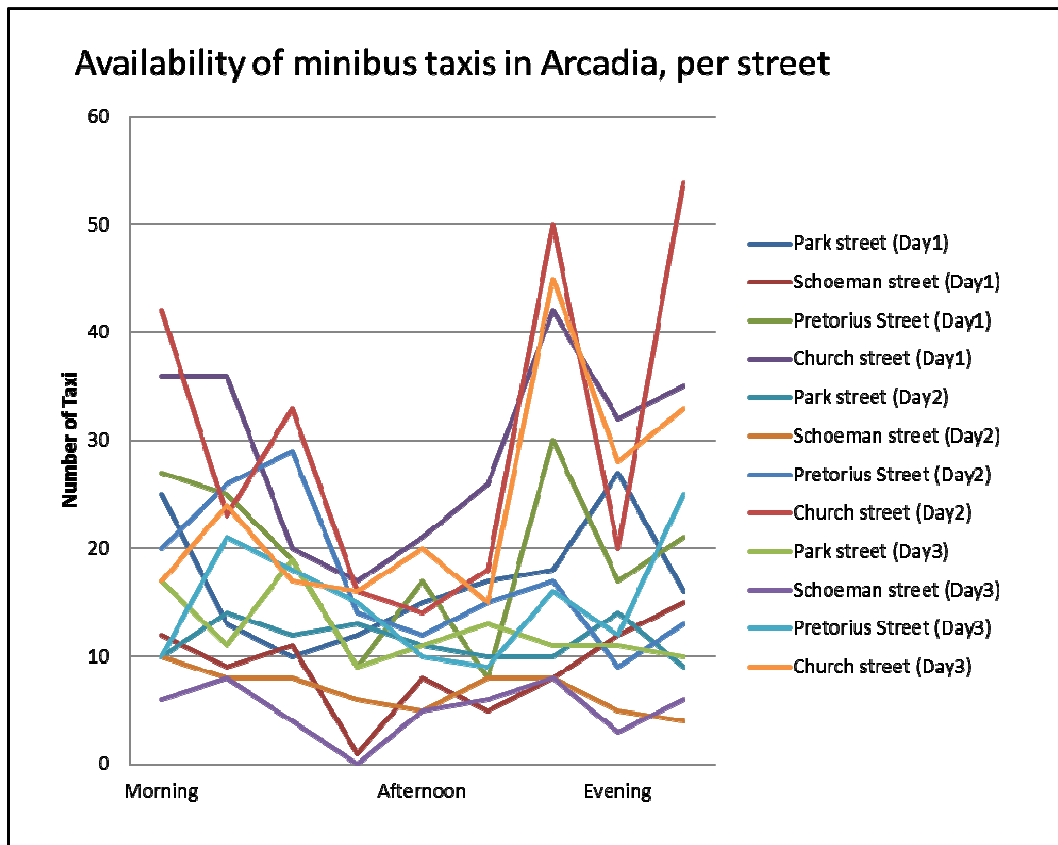


Figure 3. Minibus taxi availability over 5-minute sample periods

Table 1. Accessibility to public transport and food outlets

Within 400m of	Arcadia		Eastwood	
	Count	Percentage	Count	Percentage
Municipal bus-stop	22 969	98%	480	51%
Gautrain bus-stop	19 026	81%	474	50%
Minibus taxi route	23 096	99%	520	55%
Food shop	16 800	72%	292	31%
Informal street market with fruit and vegetables	20 980	90%	155	16%

## RESULTS

There are limitations with using buffering to determine accessibility, such as terrain: some streets in Eastwood are steep, for example. However, as 400m had been determined to be a comfortable walking distance, as discussed above, we used it as a buffer for determining accessibility to food outlets and public transport in our study area. The buffering around the food shops is shown in Figure 4 by the blue circles, with the overlying pale lines being the boundaries of Statistics South Africa's small areas, the smallest spatial units for which census data are available. As detailed in Table 1, this showed that almost all of Arcadia has ready walking access to both transport and food outlets (if they are prepared to buy from informal traders), while only about half of Eastwood residents have such access.

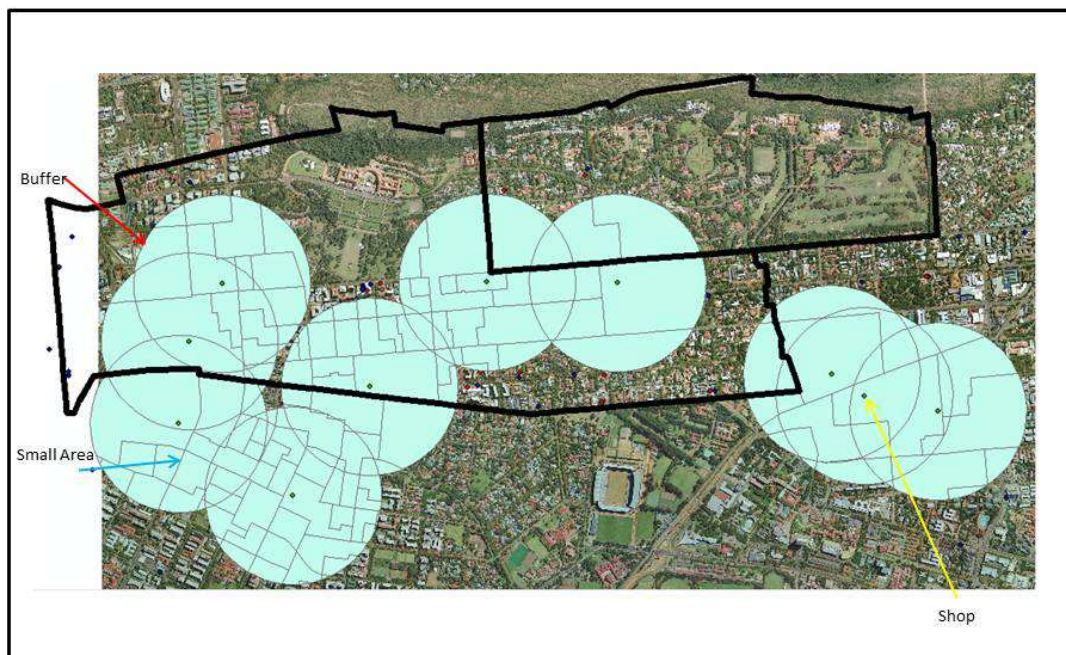


Figure 4. Buffers around food shops

## CONCLUSIONS

It would appear from our study that almost all of the population of Arcadia have ready access to retail outlets selling fruit and vegetables, and to public transport. However, this assumes that there are no other barriers to accessing healthy food, such as cultural restrictions on what can be eaten or aversion to buying from street traders. Further, it was also beyond the scope of this project to consider the wealth of the population, food prices and the constituents of a suitable diet, and hence whether or not the residents could afford to buy sufficient healthy food from their accessible retail outlets. It was also beyond the scope to examine issues such as the working hours of the population and the trading hours of the food outlets, crime and other factors that might limit mobility and hence access to food.

Eastwood has a population of only about 4% of that of Arcadia. While it has no food outlets it has double the car ownership per household and half the population has ready access to public transport. Hence, it might have a higher risk than Arcadia of being a food desert. Indeed, it might well be an example of a less obvious area at risk: reasonably affluent, but cut off (By the Union

Buildings to the west, the Magaliesberg to the north and the Presidential compound to the east) and with too small a population to support a suitable food store on its own. Currently, further similar research is being conducted in Tshwane, in the Hillcrest area around the University of Pretoria (south-east of the study area reported on here), including students in university accommodation, and in part of Mamelodi, an historically black suburb or township north-east of Pretoria.

Clearly, there is much further research that can be done, such as investigating other areas of South Africa with different spatial and socio-economic characteristics. Further research could also be done on the nutritional quality of the food available, food choices, food prices, the actual accessibility of food outlets (comfortable walking distances and carrying loads, such as for the elderly), and the time and/or distance that residents are willing travel or access food shops, be it using their own cars or public transport.

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