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RESEARCH ARTICLE

Geospatial analysis of the urban food environment and diet quality of women living in Johannesburg, South Africa

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Objective: To assess the relationship between the urban food environment and diet quality in South Africa.
Design: This cross-sectional study assessed diet quality using Dietary Diversity Score (DDS) and the Minimum Dietary Diversity for Women (MDD-W) categories and the Rapid Eating Assessment for Participants – Shortened Version (REAP-S). The urban food environment was measured using geographic information systems (GIS) to map healthy and less healthy outlets within participants' residential areas. The modified Retail Food Environment Index (mRFEI) and the Euclidean distances to food outlets were calculated.
Setting: Women in an urban suburb in Johannesburg, South Africa.
Subjects: A total of 427 generally healthy women were recruited between September 2022 and May 2023.
Outcome measured: Diet quality (DDS, MDD-W and REAP-S) and food environment (GIS, mRFEI and Euclidean distance).
Results: The mean DDS was 4.1 ± 1.4, with 64% of participants not achieving the MDD-W. The mean REAP-S score was 27.1 ± 3.3. Kernel density maps revealed that fast-food outlets were more densely clustered than grocery stores. The mean Euclidean distance from participants' homes to the nearest grocery store was 464.4 metres, while fast-food outlets were 374.8 metres away. The mRFEI score of 31% indicated an obesogenic food environment. No association was found between diet quality and proximity to any food outlets.
Conclusion: The majority of the urban women showed poor diet quality; therefore, measures to improve this should include a combination of environmental and policy interventions. Recommendations include zoning regulations to limit fast-food outlet density near residential areas, health facilities and schools, and incentivising the establishment of grocery stores and fresh produce markets.

Keywords: urban food environment, South Africa, diet quality, modified Retail Food Environment Index (mRFEI); geographic information systems (GIS)

Introduction

The complexities of dietary quality, which is a fundamental determinant of public health, are increasingly influenced by urban food environments. In a typical metro city, where grocery stores and fast-food outlets exist in close proximity, the accessibility, affordability and availability of diverse food options play a crucial role in shaping dietary choices. The formal urban food environment has the power to either support or constrain healthy dietary choices, which has implications for long-term public health outcomes.[1]

South Africa's urban food environment is characterised by a high availability of energy-dense, ultra-processed foods, which contributes to dietary patterns associated with overweight, obesity and diet-related non-communicable diseases. Nationally representative surveys consistently show high rates of overweight and obesity among South African women, particularly in metropolitan provinces, where obesity prevalence exceeds 40%.[2] Urban dietary patterns are further shaped by the rapid expansion of fast-food outlets and convenience stores within densely populated areas, as shown in several mapping studies that document the clustering of ultra-processed food retailers in South African cities.[3,4] These features of the urban food environment play a critical role in shaping food choice, diet quality and long-term health outcomes, underscoring the importance of understanding spatial and contextual determinants of dietary behaviour in South African settings.

The High-Level Panel of Experts on Food Security and Nutrition conceptual framework,[5] as well as the food environment typology,[6] proposes that food environments are among major drivers of diet quality. Findings, mainly from industrialised countries dominated by the United States, confirm that fast-food restaurants and convenience stores increase the overconsumption of unhealthy food, whereas the presence of supermarkets or grocery stores promotes increased intake of fruits and vegetables.[7,8]

Food environments in South Africa can be categorised by a combination of informal and formal food outlets.[9] Informal food outlets consist of tuck shops, street vendors, hawkers, spaza shops, small cafes, corner stalls and general dealers.[10] The formal food sector includes chain supermarkets, large wholesale and retail outlets, fast-food outlets, convenience stores, department stores, boutiques and specialty stores.[10] Food environments can also be classified as urban or rural.

Measuring the healthiness of the food environment is a complex task requiring diverse methodologies and tools to capture its multifaceted nature. Two measures that are considered appropriate to assess the food environment are the modified Retail Food Environment Index (mRFEI) and measuring the median Euclidean distance from participant residential addresses to food retailers (grocery stores and fast-food outlets).

Several measures to assess diet quality exist. One such group of measures include the *a priori* indices that qualify dietary data collected using food records, 24-hour dietary recalls, or food frequency questionnaires. These measures allow for diet quality assessment based on intake of nutrients, food groups or a combination of both nutrients and foods.[11] The Food and Agricultural Organization (FAO) recommends using the 24-hour dietary recall method to determine the dietary diversity score (DDS) and the minimum dietary diversity for women (MDD-W) categories based on food group intake.[12] Furthermore, quick methods to screen diets have become useful in clinical settings and the Rapid Eating Assessment for Participants – Shortened Version (REAP-S) survey was developed for this purpose.[13] These tools can be used to determine the diet quality of a population under investigation.

Various studies emphasise the necessity of comprehending local food environments, the measurement challenges and the consequences for public health and policy.[14–16] Despite growing research on food environments, gaps remain in understanding how the formal urban food environment influences diet quality, especially in a South African context. Therefore, the aim of this study was to assess the relationship between the urban food environment and diet quality within a South African context. The contextualised data can contribute to providing guidelines for regulations and policies for improving complex and multifaceted food environments.

Table 1: Sociodemographic and anthropometric characteristics of women residing in Johannesburg ($n = 427$)

Characteristic	Mean/*n*	SD/%
Age (years)	29.8	6.5
Pregnancy status		
Non-pregnant	142	33%
Pregnant	285	67%
Ethnicity		
Black African	378	89%
Coloured	31	7%
Indian	7	1%
White	10	2%
Other	1	<1%
Employment, $n = 426$		
Unemployed	225	53%
Employed	192	45%
Student	9	2%
Receiving social grant		
Yes	143	33%
Living Standards Measure, $n = 426$		
Low	9	2%
Medium	227	53%
High	190	45%
Anthropometric status		
BMI (kg/m^2)*, $n = 139$	28.8 ±	5.9
Underweight < 18.5	0	0%
Normal weight 18.5–24.9	37	27%
Overweight 25.0–29.9	56	40%
Obese ≥ 30.0	46	33%
MUAC (cm), $n = 407$	30.7 ±	4.6
< 23 cm	9	2%
23–33 cm	275	68%
> 33 cm	123	30%

BMI: body mass index; MUAC: mid-upper arm circumference; MUAC categories: < 23 cm = underweight; 23–33 cm = normal; > 33 cm = obese; SD: standard deviation.
*BMI was reported only for non-pregnant women. For variables with missing data, the *n*-value is indicated.

Methods

Study design and sampling procedure

This study was conducted as part of the larger CHAMP (Cardiovascular, Haemostatic, and Micronutrient status of Pregnant women) study, which focused on the nutritional and health status of women of reproductive age in Johannesburg, South Africa. To assess the women's diet quality and their exposure to the formal urban food environment, this study used a cross-sectional design. The study was conducted at an antenatal and a family planning clinic in an urban Johannesburg suburb characterised by low- to middle-income households and mixed land use. The area contains several commercial nodes with high densities of fast-food outlets and small to medium-sized grocery stores. Participant recruitment took place between September 2022 and May 2023.

The study population included generally healthy pregnant and non-pregnant women aged 18 to 49 years who could speak and read a local language (isiZulu, isiXhosa, Sesotho, Setswana, or English). Women with known non-communicable diseases such as hypercholesterolemia, renal disease, diabetes or hypertension were excluded, as were those with infectious diseases like hepatitis or tuberculosis (although HIV was not an exclusion criterion). Additionally, individuals with severe illnesses such as psychosis, lupus erythematosus, or cancer were excluded.

A minimum sample size of 139 women was found to have adequate statistical power. This was determined by the G*Power 3.1.9.4 software (https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower), based on an independent t-test, a 5% probability error (α) and a power of 80%. A consecutive sampling method was employed, where women attending the clinics were included based on availability until the sample size was reached.

Data collection

Sociodemographic information and anthropometry

Trained fieldworkers collected sociodemographic information through interviewer-administered questionnaires in a private consultation area within the clinic. This information included age, education level, employment status, marital status, living standards measure (LSM) questions and whether the household received a social grant. The LSM uses criteria such as degree of urbanisation, as well as ownership of a vehicle and household appliances to categorise households into 10 levels of living standards, 1 being lowest and 10 being highest.[17]

Anthropometric measurements included weight, measured using a calibrated SECA 813 electronic scale while participants wore light clothing and were barefoot, and height, using a SECA 213 portable stadiometer (seca, Hamburg, Germany), ensuring proper alignment using the Frankfort Plane technique. For non-pregnant women, body mass index (BMI) was calculated and defined according to the WHO categories.[18]

As BMI is not a reliable indicator of nutritional status during pregnancy, mid-upper arm circumference (MUAC) was

measured for all participants. MUAC was recorded using a spring-wound measuring tape placed at the midpoint between the acromion process of the scapula and the olecranon process of the elbow. A MUAC < 23 cm was classified as underweight, 23–33 cm as normal weight and > 33 cm as obese.[19] All measurements were taken twice, and if differences exceeded 0.1 kg for weight, 5 cm for height or 1.5 cm for MUAC, a third measurement was taken, with the mean of the two closest values used for analysis.

Food environment

To measure the food environment, the study defined the search terms for grocery stores and fast-food outlets, mapped the data on Google Maps and Google Earth and developed Kernel density heat maps as well as the mean distance to food retailers using geographic information systems (GIS). Thereafter, the mRFEI score was calculated.

The mRFEI is an environmental measure of food access, representing the proportion of 'healthy' retailers, such as grocery stores, relative to total food retailers in a region.[20] As a comprehensive indicator, the mRFEI accounts for both healthy and unhealthy food outlets, offering valuable insights into how the food environment influences diet quality.[20]

The process of defining the search terms for healthy and less healthy food outlets and the final search term list is included as supplementary material (Supplementary Table 1). The classification of 'healthy' and 'less healthy' food retailers is grounded on the Centres for Disease Control and Prevention (CDC) definition, which states that healthy food retailers include grocery stores and less healthy food retailers include fast-food outlets.[21] Although the binary classification aligns with mRFEI methodology, it does not capture variability in healthy options within fast-food outlets or unhealthy products sold in grocery stores and should be acknowledged. All food outlets were verified using virtual ground truthing, which involved Google Street View and Google searches of each food outlet at the stated addresses, examination of the operating hours, and front and inside of store photographs. A final search terms list was created for participant home addresses, fast-food outlets and grocery stores on separate Excel spreadsheets (Microsoft Corp, Redmond, WA, USA), and the files were uploaded and pinned onto Google Maps. After removing duplicates and retailers that did not fall within the area of residence of the women, a total of 423 fast-food outlets and 190 grocery stores were included.

The location data were processed using map geospatial software (QGIS 3.28.7; https://www.qgis.org/) and reprojected to EPSG:32735 – WGS 84/UTM zone 35S for high spatial accuracy and clipped to the boundaries of the suburb under investigation. Kernel density heat maps were generated to visualise food retailer density, where yellow indicated low density, green–blue represented medium density and orange-red depicted the highest density. Nearest neighbour analyses were then performed to assess spatial distribution and Euclidean distances between residential addresses and food retailers, reporting mean values.

Lastly, the mRFEI were calculated using the proportion of healthy food retailers relative to total food retailers, as per the formula:

$$mRFEI = Total\ healthy\ food\ outlets / (Total\ healthy + less\ healthy\ food\ outlets) \times 100$$

There are currently no cut-offs that categorise a healthy food environment vs. a less healthy food environment. However, a lower score indicates a more obesogenic food environment.

Diet quality

Dietary intake data were collected using two dietary assessment tools: the 24-hour dietary recall method and the Rapid Eating Assessment for Participants – Shortened (REAP-S) survey. The 24-hour dietary recall was administered using a multi-pass approach to reduce recall bias. This information was used to calculate the dietary diversity score (DDS) developed by the FAO.[12] Mixed dishes were disaggregated to record the individual food items consumed. As per FAO guidelines, milk in tea and coffee was not considered as dairy consumption by virtue of the small milk volumes typically consumed with these beverages. Foods such as fats, oils, sweets, sugar, cooldrinks, tea or coffee are not considered to contribute meaningfully to micronutrient intake and are therefore not included in the food groups and were not analysed from the 24-hour recall in this study. The 10 food groups used for the calculation of the DDS included (i) grains, roots and tubers; (ii) vitamin A-rich fruit and vegetables; (iii) vegetables other than those rich in vitamin A; (iv) meat, fish and poultry; (v) eggs; (vi) nuts and seeds; (vii) dairy products; (viii) pulses; (ix) dark green leafy vegetables; (x) fruits other than those rich in vitamin A. Each group was counted only once and thus the lowest possible DDS was 0 whereas the highest possible DDS was 10. The minimum dietary diversity for women (MDD-W) classification was then applied, where a DDS score of ≥ 5 indicates that the MDD-W was achieved, and a score of < 5 indicates that the MDD-W was not achieved.[12]

The REAP-S survey was administered to assess dietary behaviours and diet quality over the previous week. The REAP-S survey was contextualised to the South African environment and verified for face validity by nutritional experts. The contextualised REAP-S survey was pilot tested, and no additions were made. The 16-item questionnaire included questions on the consumption of wholegrains, fruits, vegetables, dairy products, meats, processed foods, fried foods and sugar-sweetened beverages.[13] Questions 1–13 were scored to determine a total REAP-S score. The total possible points range from 13 to 39, where a lower score depicts poorer diet quality (Supplementary Table 2).

Data analysis

All statistical analyses were performed using IBM SPSS (version 27; IBM Corp, Armonk NY, USA)). Continuous variables were assessed for normality using Q–Q plots and histograms. Normally distributed data were reported as means and standard deviations (SD).

For correlation analysis, Pearson's correlation coefficient was computed for normally distributed data and Spearman's correlation coefficient for non-normally distributed data. Spearman's correlation coefficients were used to assess relationships between diet quality scores, mRFEI, and distances to food retailers. The Mann–Whitney *U* test was used to compare grocery store and fast-food outlet distances between MDD-W categories. Statistical significance was set at $p < 0.05$.

Ethical considerations

This study was conducted according to the guidelines laid down in the Declaration of Helsinki (2023 revision) and all procedures involving research study participants were approved by the

Unisa-CAES Health Research Ethics Committee (2022/CAES_HREC/046). Women who showed an interest and volunteered to take part in the study received a written informed consent form, which was discussed in detail. Only women who gave their written informed consent were enrolled in the study. Privacy of the participants was ensured by using either private rooms or a dedicated space closed off from the general clinic area. Permission to use CHAMP study data was obtained from the principal investigator. Approval to conduct the study at the clinic was granted by the Johannesburg District Department of Health and the clinic manager. Confidentiality and privacy were maintained by assigning codes rather than using participants' names.

Results

Sociodemographic information and anthropometry

After data cleaning, a total sample of 427 participants was included for analysis. Table 1 is a summary of the sociodemographic characteristics of the women. The mean age of the women was 29.8 ± 6.5 years. Most participants were pregnant (67%) and Black African (89%). Over half (53%) were unemployed, and 33% were recipients of social grants. The LSM showed that 53% were in the medium living-standards group, while 45% were in the high living-standards group.

Anthropometric data revealed that 73% of non-pregnant women were overweight or obese (mean BMI: 28.8 ± 5.9 kg/m^2). MUAC measurements showed that 30% of all participants were classified as obese, while 2% were undernourished (see Table 1).

Diet quality

Results for the two diet quality measures are given in Table 2. The mean DDS was 4.1 ± 1.4, with 64% of participants not meeting the MDD-W threshold of five food groups. The mean REAP-S score was 27.1 ± 3.3, indicating moderate diet quality. A positive correlation was observed between the REAP-S score and DDS (r = 0.159, $p = 0.001$), suggesting consistency between the two diet quality measures. Across the 10 food groups, grains and meat/poultry were the most consumed, while nuts/seeds, dairy and eggs were least frequently consumed. REAP-S responses indicated frequent consumption of refined carbohydrates and fried foods, with limited intake of wholegrains and fresh produce.

Food environment

The spatial distribution of grocery stores (Figure 1) and fast-food outlets (Figure 2) in relation to residential locations graphically displays the food environment in that area. Both maps use kernel density estimation (heatmaps) to depict the concentration of food retailers, with red and orange hues indicating high-density areas, green–blue representing moderate density and yellow demonstrating low-density zones. The purple pins indicate the participants' residence locations.

In Figure 1, which maps the distribution of grocery stores, there is a high concentration in the southern region, with a mean distance of 464.37 metres between residential locations and the nearest grocery store. Additionally, the mean inter-store distance (282.91 metres) is greater than that of fast-food outlets, suggesting that grocery stores are less densely clustered compared with fast-food outlets.

In Figure 2, which represents fast-food outlet distribution, there is a clear clustering of fast-food establishments in the southern part, with a mean distance of 374.81 metres between residential locations and the nearest fast-food outlet. The mean inter-store distance is 177.72 metres, highlighting the dense concentration of fast-food retailers in certain areas, particularly around commercial hubs.

There was a total of 190 grocery stores and 423 fast-food outlets in the area studied, resulting in an mRFEI score of 31%, which indicates that only 31% of the retailers in the study area are classified as healthy retailers.

Relationship between diet quality and food environment

The relationships between diet quality and proximity to food retailers are displayed in Table 3. The Mann–Whitney *U* test was used to compare distances between food retailers and participants with low dietary diversity (MDD-W < 5) vs. those who met the MDD-W threshold (≥ 5 food groups). Additionally, Spearman's correlation assessed associations between diet quality scores (DDS and REAP-S) and distances to food retailers.

The Mann–Whitney *U* test results indicate no significant differences in proximity to grocery stores ($p = 0.334$) or fast-food outlets ($p = 0.180$) between participants with lower and higher dietary diversity. This suggests that distance to food retailers did not influence whether participants achieved adequate dietary diversity.

Similarly, Spearman's correlation analysis found no significant relationships between diet quality scores (DDS and REAP-S) and distances to grocery stores or fast-food outlets (all *p*-values > 0.05). The correlation coefficients were weak, indicating that physical proximity to food retailers did not have a meaningful impact on dietary diversity or overall diet quality.

Table 2: Diet quality indicators of women

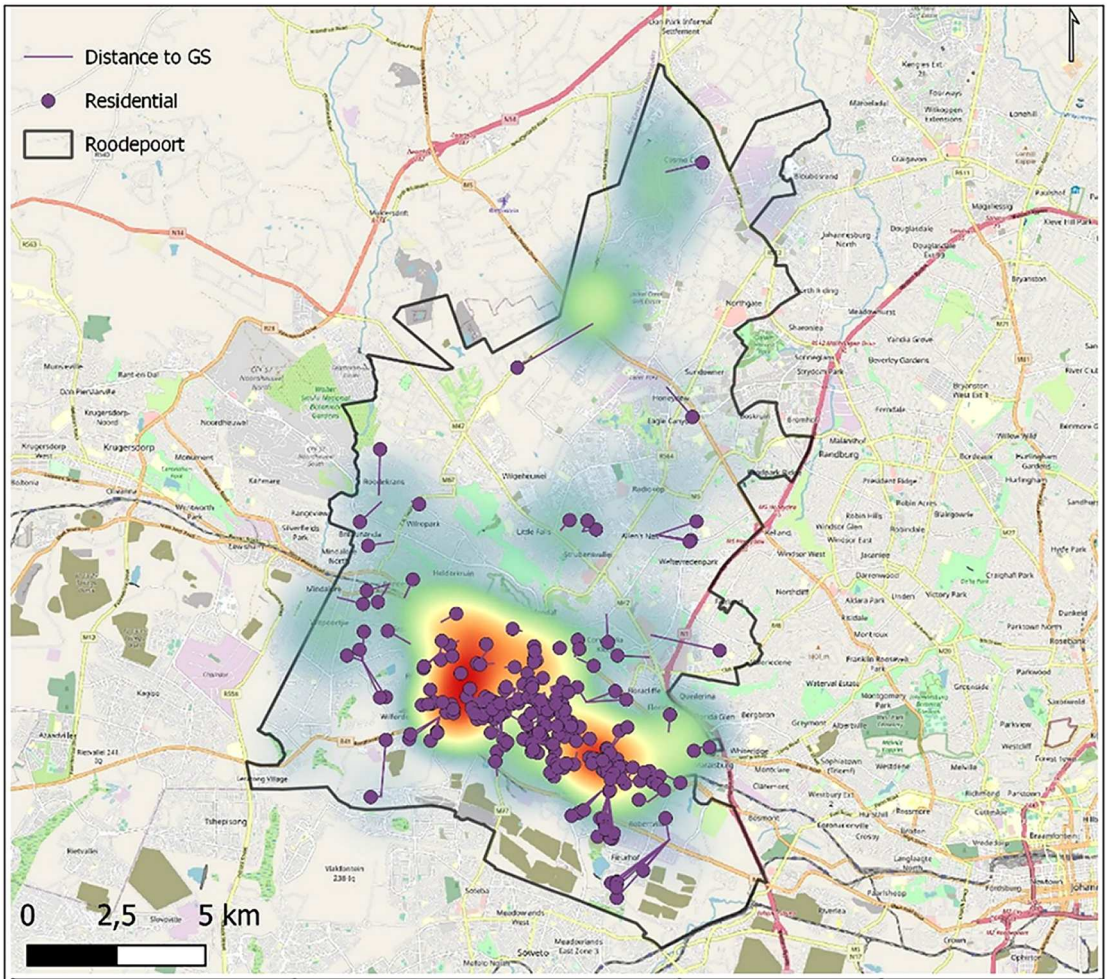
Diet quality measure	Mean/*n*	SD/%
DDS, *n* = 424	4.1	1.4
MDD-W, *n* = 424		
< 5 food groups	273	64%
5–10 food groups	151	36%
REAP-S score, *n* = 427	27.1	3.3
	Pearson's correlation coefficient	
Correlation between REAP-S score and DDS	$r = 0.159$, $p = 0.001$	

DDS: dietary diversity score; MDD-W: Minimum Dietary Diversity for Women; REAP-S: Rapid Eating Assessment for Participants – Shortened; $p < 0.05$: significant difference.

Discussion

The diet quality of the women showed inadequate dietary diversity. This aligns with findings from previous South African studies that indicate low dietary diversity among women, particularly in lower-income and urban communities.[22,23] Low dietary diversity is concerning, as it has been linked to inadequate micronutrient intake, which can negatively impact maternal and child health outcomes.[12,24]

The spatial analysis of food retailers revealed that fast-food outlets were more densely clustered than grocery stores. The mean distance to grocery stores (464.37 metres) vs. fast-food outlets (374.81 metres) can indicate that unhealthy food options were practically more accessible than healthier



Mean Distance (m) to GS	Mean distance (m) between Stores	Number of Stores	Number of Address
464.37	282.91	190	226

Figure 1: Spatial distribution of grocery stores and residential locations in Roodepoort, Johannesburg.

alternatives, although this was not significant. This is reflected in the mRFEI score of 31%, which indicates a predominantly obesogenic food environment, characterised by a higher proportion of unhealthy food retailers relative to grocery stores (423 fast-food outlets vs. 190 grocery retailers). These findings are consistent with studies in South Africa that have reported an unequal distribution of food retailers, where lower-income areas tend to have higher densities of fast-food outlets compared with supermarkets, limiting access to healthy foods.[20,25]

The REAP-S findings further highlight the behavioural dimensions of diet quality among the women in this study. Responses indicated frequent consumption of fried foods, refined starches, processed meats and sugar-sweetened beverages, alongside limited intake of wholegrains, fruits, vegetables and unprocessed protein sources. These behavioural patterns mirror broader dietary shifts documented in South African urban settings, where affordability, convenience and widespread availability of ultra-processed foods shape everyday food choices.[3,4] The low engagement in healthier dietary behaviours observed in this study is consistent with research showing that urban women often face structural and economic barriers to purchasing and preparing nutrient-dense foods, contributing to suboptimal diet quality despite physical proximity to healthier food outlets. The REAP-S results therefore reinforce the multidimensional nature of diet quality challenges, emphasising that dietary behaviour is influenced not only by geographic access but also by preference formation, marketing exposure, time constraints and the relative cost of healthier foods.

Although no significant association was shown between the diet quality scores and the food environment measures, most of the study participants were overweight or obese and living in an obesogenic food environment. This is indicative that there may have been a relationship but that factors beyond geographic access, such as affordability, food preferences, cultural influences, nutrition knowledge and marketing, may play a more significant role in shaping dietary choices.[26,27] This is similar to research done by Chan et al.,[28] where they reported that while the food environment in the area they investigated (Maastricht, Netherlands) appeared marginally unhealthy, the differences in the food environment did not relate to the quality of food that participants reported consuming.

Even though our findings suggest that simply having access to healthier food options in a neighbourhood does not guarantee better diet quality among residents, other research, in Canada, has shown that food destination density was positively associated with diet quality,[29] which highlights the complexity of

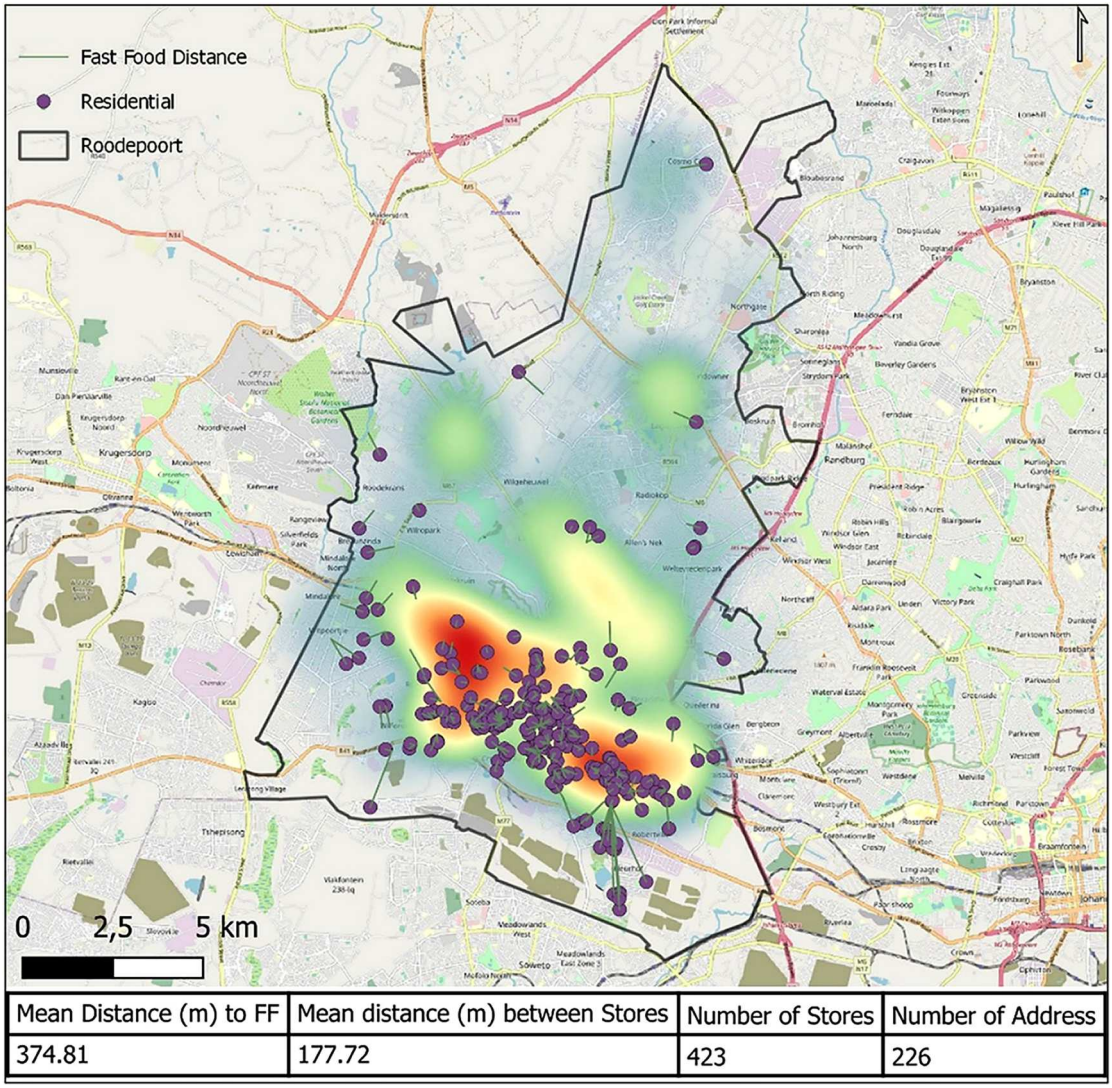


Figure 2: Spatial distribution of fast-food outlets and residential locations in Roodepoort, Johannesburg.

food choice determinants beyond mere physical availability of or proximity to food outlets.

The strengths of this study included more than one measure of diet quality and as well as the food environment on a reasonable sample size. This study has several limitations that should be acknowledged. First, as participants were recruited from an antenatal and family planning clinic, the findings are subject to selection bias and are not generalisable to all urban women in Johannesburg. The voluntary nature of participation may also have introduced self-selection bias, as women who agreed to participate may differ systematically from those who declined. Second, the cross-sectional study design limits the ability to infer causality between food environment exposure and diet quality. The dietary data, collected through 24-hour recalls and self-reported behavioural measures, are prone to recall and reporting bias, which may have resulted in underreporting or misclassification of certain foods.

Table 3: Relationship between diet quality, dietary diversity and distances to food retailers

	Mann–Whitney *U* results				Spearman's correlation	
Variable	**MDD-W < 5**	**MDD-W 5–10**	**Z-stat**	***p*-value**	***r*-stat**	***p*-value**
Median distance to grocery store (m)	241.8	216.7	−0.968	0.334		
Median distance to fast-food outlet (m)	371.7	297.3	−1.344	0.180		
REAP-S score and distance to grocery store					−0.022	0.740
REAP-S score and distance to fast-food outlet					−0.036	0.592
DDS and distance to grocery store					−0.065	0.333
DDS and distance to fast-food outlet					−0.039	0.563

MDD-W: Minimum Dietary Diversity for Women; REAP-S: Rapid Eating Assessment for Participants (Shortened); DDS: Dietary Diversity Score; Mann–Whitney *U* test used to compare MDD-W categories to distance to grocery store and distance to fast-food outlet; Spearman's correlation coefficient was used to correlate the dietary diversity scores (REAP-S and DDS) to the distance to grocery store and fast-food outlet; $p < 0.05$ = significant difference.

Additionally, the study excluded informal food outlets such as spaza shops and street vendors, which constitute an important component of urban South African food environments; their omission may underestimate overall exposure to less healthy food sources. The uneven distribution of pregnant and non-pregnant women in the sample may have further influenced dietary patterns and anthropometric characteristics, limiting between-group comparisons. Despite these limitations, the study provides valuable insights into the relationship between urban food environments and diet quality among women of reproductive age.

Informed by the findings of the body of evidence, regulatory guidelines should consider the implementation of zoning laws that control the density and spatial distribution of fast-food outlets in residential areas, with particular attention to their proximity to health facilities, schools and community centres. Given the obesogenic nature of the urban food environment observed in this study, such zoning regulations could serve to limit the over-concentration of less healthy food outlets and mitigate their potential influence on dietary behaviours. Simultaneously, policy interventions should encourage the establishment of grocery stores and fresh produce markets in low-income areas through targeted incentives. This could include financial support, tax relief or infrastructure assistance aimed at enhancing access to healthier food options in underserved communities, thereby improving dietary diversity and overall diet quality among women of reproductive age and other vulnerable population groups. In addition to the suggested environmental and regulatory measures, complementary nutrition education and economic interventions are essential to improve diet quality in urban communities. Integrating routine dietary counselling into primary healthcare visits, particularly antenatal and family planning services, may support healthier food practices among women.[30] Economic interventions, including subsidies for fresh produce, fiscal incentives for healthier food retail in underserved areas and pricing strategies that discourage excessive consumption of ultra-processed foods, could further enhance access to nutritious foods.[31] Such multisectoral approaches are necessary to shift both the affordability and desirability of healthier diets in urban contexts.

Recommendations

Further research should explore the impact of food affordability and purchasing power on diet quality, as economic constraints may outweigh the influence of physical access to food outlets. Additionally, research should expand to include the informal food sector (e.g. spaza shops, street vendors) to better understand its role in dietary patterns. Longitudinal studies could help determine causal relationships between food environments and diet quality over time. Finally, mixed-method approaches incorporating qualitative insights could provide a deeper understanding of the social and cultural drivers of food choices in urban South Africa.

Conclusion

This study highlights the complex interplay between the formal urban food environment and diet quality of women residing in an urban area in South Africa. Despite living in an obesogenic environment with greater proximity to fast-food outlets than grocery stores, no direct association was found between diet quality and the measured food environment indicators. However, the poor dietary diversity and high prevalence of overweight and obesity among participants signal that the broader food system, including affordability, food preferences and cultural influences, likely play a substantial role in shaping dietary patterns.

This poor dietary diversity coupled with high obesity prevalence underscores the need for holistic, multi-sectoral strategies that go beyond improving physical access to healthy food. Policy interventions should prioritise reshaping the urban food environment through zoning laws, incentivizing healthy food retail in underserved areas and embedding nutrition education into community health initiatives.

By creating enabling environments that support affordable, diverse and nutritious food choices, countries can foster healthier urban populations and help reduce the rising prevalence of overweight and obesity in low- and middle-income countries.

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