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Transformation of Global Agri-Food Systems:
Trends, Driving Forces, and Implications for Developing Countries

University of Goettingen

GlobalFood Discussion Papers

No. 131

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Makaiko G. Khonje
Matin Qaim

June 2019

RTG 1666 GlobalFood · Heinrich Düker Weg 12 · 37073 Göttingen · Germany
www.uni-goettingen.de/globalfood

ISSN (2192-3248)

Suggested Citation:

Khonje, M.G., M. Qaim (2019). Modernization of African food retailing and (un)healthy food consumption: Insights from Zambia. GlobalFood Discussion Paper 131, University of Goettingen. http://www.uni-goettingen.de/de/213486.html.

Modernization of African food retailing and (un)healthy food consumption: Insights from Zambia

Makaiko G. Khonje [a*] and Matin Qaim [a]

[a] Department of Agricultural Economics and Rural Development, University of Goettingen, 37073, Goettingen, Germany

* Corresponding author. Tel.: +4915217034785; E-mail: makaiko.khonje@uni-goettingen.de

Acknowledgements

This research was financially supported by the German Research Foundation (DFG), grant number RTG 1666 (GlobalFood).

Abstract

Food environments in Africa are changing rapidly, with modern retailers – such as supermarkets, hypermarkets, and fast-food restaurants – gaining in importance. Changing food environments can influence consumer food choices and dietary patterns. Recent research suggested that the growth of supermarkets leads to more consumption of processed foods, less healthy diets, and rising obesity. However, the use of modern retailers may differ by socioeconomic status, which was hardly considered in previous work. Furthermore, existing studies on nutrition effects focused mainly on the role of supermarkets, although most consumers obtain their food from various sources. We add to this research direction by examining more explicitly the relationships between socioeconomic status, use of different modern and traditional retailers, and dietary patterns. The analysis uses household survey data from urban Zambia. Results show that two-thirds of the households use modern and traditional retailers simultaneously, whereby richer households are more likely than poorer households to use supermarkets and hypermarkets. Use of modern retailers is positively associated with higher consumption of ultra-processed foods, also after controlling for income and other socioeconomic factors. However, the use of traditional grocery stores and kiosks is also positively associated with the consumption of ultra-processed foods, suggesting that modern retailers are not the only drivers of dietary transitions.

Keywords

Retail modernization; supermarkets; food consumption; diets; nutrition transition; Zambia

1. Introduction

Food systems in developing countries have been evolving rapidly for the last few decades, with a growing role of modern retailers such as supermarkets, hypermarkets, convenience stores, and fast-food restaurants (Gómez and Ricketts, 2013; Popkin, 2014; Reardon and Timmer, 2014; Andersson et al., 2015). The modernization of food systems is largely driven by consumer preference changes resulting from urbanization, income growth, and globalization (Tschirley et al., 2015; Minten et al., 2017; Qaim, 2017; Lu and Reardon, 2018; Reardon et al., 2019). However, at the same time consumer preferences and demand may also be shaped by changing food environments (Popkin, 2017; Laska et al., 2018; Popkin and Reardon, 2018). For example, a shift from traditional markets to modern supermarkets and hypermarkets has effects on the types of food offered, as well as on food variety, food prices, and shopping atmosphere, all of which may influence consumer choices (Asfaw, 2008; Hawkes, 2008; Reardon and Timmer, 2014). Understanding the links between changing food environments and food consumption patterns is important to promote food security and healthy diets. This is especially true in Africa, where poverty and undernutrition are still widespread but where overweight and obesity are also on the rise (Ruel et al., 2017; Harris et al., 2019)

Available research suggests that the modernization of food retailing may make calories more affordable for urban consumers but — at the same time — may foster the nutrition transition towards more highly processed foods that are rich in fat, sugar, and salt, but contain low amounts of micronutrients and other ingredients for healthy nutrition (Asfaw, 2011; Gómez and Ricketts, 2013; Umberger et al., 2015; Popkin and Reardon, 2018; Freire and Rudkin, 2019). Recent studies with data from Africa show that the growth of supermarkets contributes to increased consumption of processed foods and a higher body mass index (BMI), also after controlling for household income (Kimenju et al., 2015; Rischke et al., 2015; Demmler et al., 2018).

However, the existing research has several shortcomings. First, many of the studies analyzing the effects of a modernizing retail sector compared food consumption and nutrition between users and non-users of supermarkets (Asfaw, 2008; Kimenju et al., 2015; Rischke et al., 2015; Umberger et al., 2015; Demmler et al., 2018; Rupa et al., 2019). While this approach provides interesting insights, it neglects the fact that most people do not buy all of their food in one retail outlet. Supermarket users may also use traditional retailers for some of the food purchases (Berger and van Helvoirt, 2018; Lu and Reardon, 2018). Conversely, supermarket non-users may use convenience stores, fast-food restaurants, or other types of modern retailers. Hence, focusing only on the differences between users and non-users of supermarkets may potentially provide an incomplete picture of the wider links between food retailing and dietary choices. Second, most available studies look at average effects of supermarkets on the entire sample of consumers without considering that different population segments may use different types of retailers to varying degrees. Third, available studies typically analyze diets and consumption patterns by differentiating between food groups but without properly accounting for the level of food processing. Standard food consumption surveys often capture highly processed foods only in aggregate form, because highly processed foods were traditionally not widely consumed in poorer population segments. However, this has been changing rapidly, implying that survey formats need to be adapted as well.

Here, we address these shortcomings with more detailed data and statistical analysis. Using household survey data from urban Zambia in Southern Africa and different econometric techniques, we analyze the associations between household socioeconomic status, the use of different types of retailers, and dietary patterns. In particular, we analyze what type of socioeconomic characteristics influence the choice of modern and traditional food retailers. Moreover, we analyze to what extent the use of different retailers is associated with the

consumption of processed and unprocessed foods and products belonging to different healthy and unhealthy food groups. To our knowledge, this is the first study that looks into these issues with detailed data from Africa. Zambia is an interesting empirical setting for this analysis, because it has recently experienced rapid growth of supermarkets, hypermarkets, and other modern retailers (Tschirley et al., 2015). Moreover, Zambia is experiencing a triple burden of malnutrition, where undernutrition and micronutrient malnutrition coexist with rising overweight and obesity (Steyn and Mchiza, 2014; Harris et al., 2019). Hence, our results may help to project how diets evolve with further changes in retail environments and what type of policy responses might be useful. We expect that the insights from Zambia can be useful also for other countries in Africa, where the modernization of the food retail sector is still at earlier stages.

The rest of this paper is organized as follows. Section 2 provides an overview of the most important types of modern and traditional food retailers in Zambia. Section 3 explains materials and methods, including a description of the household survey, the measurement of key variables, and the econometric models used. Section 4 presents and discusses the results, whereas section 5 concludes.

2. Modern and traditional food retailers in Zambia

Food retail environments in many African countries have been changing rapidly during the last 20 years, with a considerable growth of modern retailers such as supermarkets and hypermarkets (Tschirley et al., 2015; Ziba and Phiri, 2017). Zambia is one of the countries in the Southern African region with particularly high growth rates of modern retailers (PlanetRetail, 2017; Ziba and Phiri, 2017). For instance, our own review of internet sources supplemented by key informant interviews in the local context revealed that the number of large shopping malls in Lusaka City increased from one in 1995 to 25 in 2018 (Table A1 in the Appendix). These

shopping malls with a big variety of shops are also the main locations of supermarkets, hypermarkets, and fast-food restaurants. Smaller supermarkets and convenience stores are also found in other locations. In the following, we characterize the main types of modern food retailers that we also use in the empirical analysis below. Subsequently, we characterize the most important types of traditional food retailers as well. An overview of the key characteristics of each type of retailer is also shown in Table 1. The classification builds on criteria similar to those used in previous studies (Rischke at al., 2015; Berger and Helvoirt, 2018; Demmler et al., 2018), partly adjusted to the local context based on key informant interviews.

The largest modern retailers are hypermarkets with a floor space of more than 200 m^2. The main hypermarket chains in Lusaka are Game Stores, Cheers, and Choppies. Supermarkets are similar to hypermarkets, but are smaller with 100-200 m^2 of floor space. Major supermarket chains in Lusaka include Shoprite, PicknPay, among others. Both hypermarkets and supermarkets are self-service stores with a wide range of fresh and processed products, including chilled and frozen foods. Convenience stores also belong to the category of modern retailers. They are also self-service in nature but are smaller (<100 m^2) and offer a more limited range of food products. Finally, we include fast-food restaurants — such as Hungry Lion, Debonairs Pizza, and KFC — in the group of modern retailers (Table 1).

[Insert Table 1]

Traditional food retailers include grocery stores, traditional markets, roadside markets, and neighborhood kiosks (Table 1). None of the traditional retailers has self-service options, all provide over-the-counter services. Traditional retailers are mostly owner-operated and do not belong to larger chains. Customers can negotiate prices to some extent and can usually also buy foods on credit. The range of products and brands offered by traditional retailers is smaller than that offered by modern retailers. Packaging sizes are also smaller. Sometimes traditional retailers

repackage foods such as sugar, flour, or cooking oil, into very small packets, which are particularly demanded by poor customers. Traditional retailers rarely sell frozen and chilled foods, mostly due to lack of refrigeration facilities.

3. Materials and methods

3.1. Household survey

The data used in this study were collected through a household survey in Lusaka, the capital city of Zambia, between April and July 2018. We surveyed a total of 475 households using a two-stage random sampling procedure. At the first stage, we purposively selected 14 *compounds* within Lusaka urban. These *compounds* were selected based on the locations of major shopping malls as well as information provided by the City Council on mean income levels in the different *compounds*. Based on population distributions, we selected four *compounds* with high mean income levels (Avondole, Chalala, Kabulonga and Woodlands), four *compounds* with medium income levels (Chelston, Chilenje, Kabwata and PHI), and six *compounds* with low income levels (Chawama, Chazanga, Gardens, Kalingalinga, Kaunda Square and Ng'ombe). At the second stage, depending on *compound* size, we randomly sampled around 34 households from each *compound* for study participation. The spatial distribution of selected *compounds* and households is shown in Figure A1 in the Appendix. The sample should be fairly representative of households in the urban parts of Lusaka.

In each of the sample households, we carried out a face-to-face interview with the household head or another adult responsible for food purchase decisions. The computer-aided structured interviews were conducted in the local language by a small team of interviewers that we recruited, trained, and supervised. The questionnaire that we had developed for this purpose captured general economic and socio-demographic information of the household and its

members. Food consumption data were collected through a 7-day household-level recall, using a detailed list of food items typically consumed in the local setting. In addition to food quantities and expenditures, we also collected data on the processing level and the source of each food item, focusing particularly on the different modern and traditional retailers. These data were used to construct various key variables, as discussed below.

3.2. Measurement of key variables

We are interested in analyzing the relationship between socioeconomic characteristics and use of different retailers. Socioeconomic characteristics of interest include household income levels, education, gender, and age of the household head, household size and structure, ethnicity, religion, car ownership, among others. Previous research showed that these characteristics can influence the decision which retailers to use (e.g., Asfaw, 2008; Rischke et al., 2015; Umberger et al., 2015; Demmler et al., 2018; Rupa et al., 2019). The use of different retailers is measured through a set of dummy variables capturing whether or not the household purchased any food from a particular type of retailer during the 7-day recall period. In addition to the retailer dummies, we also look at the share of the total household food budget spent in different retail outlets.

We are also interested in analyzing associations between the use of different retailers and dietary patterns. One way of looking at dietary patterns is through classifying all food items consumed by their level of processing. We differentiate between unprocessed foods, primary processed foods, and ultra-processed foods (Demmler et al., 2018). For these three processing levels, we calculate household expenditures and food expenditure shares. Unprocessed foods include wholegrain cereals and pulses, fresh fruits and vegetables, eggs, fresh milk, among others. Primary processed foods include milled cereals and fresh meat and fish. Ultra-processed

foods include bread, pasta, dairy products, sausages and meat products, soft drinks, sweets, and other ready-made dishes and snacks (Table A2 in the Appendix). Ultra-processed foods are generally considered less healthy than unprocessed foods, because they often have high sugar, fat, and salt contents, and low fiber and micronutrient contents. Research has shown that high consumption of ultra-processed foods is associated with obesity and increased risks of chronic diseases such as coronary heart diseases, stroke, and diabetes (Monteiro et al., 2010; Beatty et al., 2014; Steyn and Mchiza, 2014; Harris et al., 2019).

Separate indicators of dietary patterns that we use are the quantities of different food groups consumed by the households during the 7-day recall period. We use the following food groups: cereals and tubers, legumes, fruits, vegetables, meat and fish, dairy products, eggs, oils and fats, and sugar and sugar-sweetened beverages. While the last two food groups are rather considered unhealthy, the others contain important nutrients and can therefore contribute to healthy nutrition.

3.3. Statistical analysis

We start the analysis by calculating descriptive statistics for the use of modern retailers and dietary patterns and comparing between households of different socioeconomic status. For this purpose, we subdivide the sample into three groups of almost equal size, namely the lower, middle, and upper income terciles. In addition, we use regression models to analyze the associations of interest more formally.

To analyze the socioeconomic factors that influence the use of different types of retailers, we estimate models of the following type:

$$\boldsymbol{FR}_i = \alpha + \beta' \boldsymbol{X}_i + \varepsilon_i, \tag{1}$$

where $\boldsymbol{FR}_i$ is a vector of the types of food retailers that household *i* used during the 7-day recall period, $\boldsymbol{X}_i$ is a vector of socioeconomic variables, and ε_i is a random error term. $\boldsymbol{FR}_i$ is measured

through a set of dummy variables, one for each of the modern and traditional retailers considered, so that we use a probit specification to estimate equation (1). Households can use more than one type of retailer, and the decisions for different retailers are likely correlated. We use a multivariate probit model to account for possible error correlation between the equations for different retailers (Cappellari and Jenkins, 2003).

Next, we analyze in how far the use of particular retailers is associated with more or less healthy dietary patterns by estimating regression models of the following type:

$$\boldsymbol{DP}_i = \gamma + \delta' \boldsymbol{FRS}_i + \rho' \boldsymbol{X}_i + u_i \qquad (2)$$

where $\boldsymbol{DP}_i$ characterizes the observed dietary pattern of household i, and u_i is the random error term. $\boldsymbol{FRS}_i$ is a vector of variables representing the food expenditure shares of each of the retailers, and $\boldsymbol{X}_i$ is a vector of socioeconomic characteristics. In one set of regressions, $\boldsymbol{DP}_i$ will characterize expenditures for foods with different processing levels, while in another set of regressions $\boldsymbol{DP}_i$ will characterize the consumption of different healthy and unhealthy food groups.

For the processing level equations, we use an ordinary least squares (OLS) estimator. As error term correlation between the different equations is possible, we also use a seemingly unrelated regression (SUR) estimator to compare the results. Furthermore, in addition to estimates with the full sample, we estimate separate models for households below and above the poverty line, as the role of modern retailers may potentially differ by socioeconomic status. For the food group equations, we use a Tobit estimator, because the consumption quantities are left-censored at zero. For all models, we use cluster-corrected standard errors because household observations are clustered at the level of city *compounds*.

We start estimating the models in equation (2) by only considering one food retailer in $\boldsymbol{FRS}_i$, namely supermarkets. This is similar to previous studies that had analyzed the effects of supermarkets on diets and nutrition (Asfaw, 2008; Rischke et al., 2015; Umberger et al., 2015; Demmler et al., 2018; Rupa et al., 2019). However, conclusions based on such models that only consider the use of supermarkets may be incomplete and misleading, as households typically use various types of retailers. To demonstrate this, we re-estimate the same models with all types of retailers included. We note that the use of food retailers (vector $\boldsymbol{FRS}_i$) is endogenous, so the estimated δ coefficients from equation (2) should not be interpreted as causal effects. Using instruments to deal with possible endogeneity bias would be possible in principle but is difficult in our case with a total of eight endogenous variables. We were unable to identify eight valid instruments, which is why we interpret the estimated coefficients only in terms of associations.

4. Results and discussion

4.1. Household socioeconomic characteristics

Table 2 shows summary statistics for selected household socioeconomic variables (additional variables are shown in Table A3 in the Appendix). Average annual per capita incomes range from US$ 410 in the lowest tercile to over US$ 5,000 in the highest tercile. Twenty-seven percent of the sample households fall below the international poverty line of US$ 1.90 per capita in purchasing power parity terms. We observe large differences between the income terciles in terms of education, occupation, and car ownership. While only 3% of the households in the lowest tercile own a car, in the highest tercile the share is 60%.

The middle and lower parts of Table 2 show food consumption patterns. The average consumption of cereals, tubers, and legumes does not differ much between the three income terciles, whereas the consumption of most of the other food groups increases considerably with

income, as one would expect. Noteworthy is the very low consumption of fruits in all three income terciles. Many of the households consume fruits only occasionally. In terms of processing levels, for the sample as a whole, 25% of the food expenditures are made for unprocessed foods, 40% for primary processed foods, and 35% for ultra-processed foods. Strikingly, the expenditure share for ultra-processed foods does not increase with income, underlining that the purchase and consumption of these types of foods are very common for all types of households in Lusaka City.

[Insert Table 2]

4.2. Role of modern and traditional retailers

Table 3 shows the proportion of households using the different modern and traditional retailers. This refers to the sources of the foods consumed during the 7-day recall period used in the household survey. While the regular use of hypermarkets and fast-food restaurants is relatively low, the majority of all households (73%) used supermarkets. Even more (76%) used at least one of the modern food retailers. As expected, the use of modern retailers increases considerably from the lowest to the highest tercile. In the highest tercile, almost all households used at least one of the modern retailers. Most households in all income terciles used more than one type of retailer during the 7-day recall period. Two-thirds used both modern and traditional retailers.

[Insert Table 3]

Figure 1 shows that the average frequency of traditional retailer use is higher than that of modern retailer use. Many households make one larger purchase in a supermarket or hypermarket once a week and then purchase additional foods from traditional retailers whenever needed during the week. The finding that many consumers use both modern and traditional retailers is consistent with a recent study for Nairobi (Berger and van Helvoirt, 2018) and also with

theoretical predictions for a setting with large socioeconomic heterogeneity (Lu and Reardon, 2018). The use of some traditional retailers decreases with rising household income, which is especially true for grocery stores and roadside markets. In contrast, the use of traditional markets and kiosks does not decrease with rising income (Table 3).

[Insert Figure 1]

Figure 2 shows the distribution of household food expenditure shares by type of retailer. For the sample as a whole, 42% of the food expenditures are made for purchases from modern retailers. This is very high when compared to most other African countries, even when only looking at urban areas (Qaim, 2017). The rest of the household food budgets are spent (58%) in traditional retail outlets. Notable differences are observed between the three income terciles. While households in the highest tercile make 63% of their food expenditures in modern retailers, for households in the lowest tercile this share is only around 20%. This is in line with Figuié and Moustier (2009) and Berger and van Helvoirt (2018) who found that poor households use modern retailers less extensively than rich households in Vietnam and Kenya, respectively. Among the modern retailers, supermarkets account for the lion's share of food expenditures for all households in Lusaka.

[Insert Figure 2]

4.3. Factors influencing the use of modern retailers

We now look at the estimation results from the multivariate probit model to analyze factors influencing the household decision whether or not to use particular types of retailers (see equation 1 above). Average estimated marginal effects are shown in Table 4. Household income has a positive effect on the likelihood of using modern supermarkets and hypermarkets and a negative effect on the likelihood of traditional grocery stores and roadside markets, also after

controlling for a number of other household characteristics. In contrast, and consistent with the descriptive statistics above, the likelihood of using traditional markets and kiosks does not decrease with rising income. The use of traditional kiosks even increases when household income rises.

[Insert Table 4]

Education also affects the use of modern supermarkets positively. Similarly, more education tends to increase the use of fast-food restaurants. This latter result may surprise, because fast food dishes are typically not very healthy, and better-educated households are generally expected to know more about healthy nutrition. On the other hand, education may also be a proxy of more exposure to global influences and lifestyles, which may contribute to a certain preference for westernized diets. Furthermore, better-educated consumers are often more conscious about food safety issues. In many developing countries, modern retailers and restaurants are perceived to fulfill higher food safety standards than their traditional counterparts (Mergenthaler et al., 2009; Gorton et al., 2011; Schipmann and Qaim, 2011; Wertheim-Heck et al., 2015). This could also explain why households with more education are significantly less likely to use traditional grocery stores, roadside markets, and kiosks. For instance, each additional year of schooling reduces the likelihood of purchasing food from a roadside market by 2.8 percentage points.

The other results in Table 4 show that household size has a negative effect on using supermarkets and a positive effect on using traditional grocery stores and roadside markets. These results are probably related to shop opening hours and convenience. Supermarkets and hypermarkets have longer and more reliable opening hours than most traditional retailers. Furthermore, given the wide variety of products offered in supermarkets and hypermarkets, one-stop shopping is easily possible, which is much less the case for traditional retailers. These conditions make supermarkets particularly convenient for people with time constraints. In larger

households, time constraints may be less severe, at least for some household members, so that the use of traditional retailers is more easily possible. Time constraints could also explain why people with an office job are more likely to use supermarkets and less likely to use roadside markets and kiosks. Also in line with this is the fact that male-headed households are less likely to use supermarkets and more likely to use traditional retailers than female-headed households. Female household heads are typically the main income earners of the family and the main homemakers simultaneously, which means that only little time is available for shopping.

Other socioeconomic characteristics that seem to influence the choice of modern and traditional retailers include car ownership, ethnicity, and religion (Table 4). Car ownership increases the likelihood of using modern retailers and decreases the likelihood of using traditional retailers. This is unsurprising given that most of the supermarkets and hypermarkets are located in larger shopping malls that typically also provide easy access by car and parking space. The patterns for ethnicity and religion are probably related to geographic clustering. On average, Tonga and catholic households are living more closely to shopping malls with a large hypermarket.

The error term correlation matrix for the multivariate probit model is shown in Table A4 in the Appendix. The null hypothesis of zero correlation between the equations for the different retailers is rejected, suggesting that the multivariate probit specification is preferred over separate single equation probit models. The correlation coefficients shown in Table A4 can also be interpreted economically. A positive correlation means that consumers use both retailers in a complementary way. This is observed, for instance, between hypermarkets and modern convenience stores. While the former are used for making large-quantity purchases, the latter are used for making complementary smaller purchases. A positive correlation is also observed between traditional grocery stores and neighborhood kiosks. On the other hand, we also observe negative

correlations, for instance between modern supermarkets and traditional grocery stores, indicating that these types of retailers are rather considered substitutes. Both offer a similar range of products only that the variety in modern supermarkets is larger. These results indicate that traditional grocery stores may suffer the most from a shrinking customer base when the expansion of modern supermarkets continues. Other traditional retailers — such as traditional markets and neighborhood kiosks — may also be affected negatively by further supermarket expansion, but to a lesser extent than grocery stores. These types of competitive relationships between modern and traditional retailers are in line with earlier observations in Asia, Europe, and the USA (Suryadarma et al., 2010; Schipmann and Qaim, 2011; Stewart and Dong, 2018; Hovhannisyan et al., 2019).

4.4. Associations between retailers and food processing levels

We now estimate the associations between the use of different retailers and household dietary patterns (see equation 2 above), starting with the disaggregation of the foods consumed by processing level. Results are summarized in Table 5 (full estimation results are shown in Table A5 in the Appendix).[1] The upper part of Table 5 (panel A) shows models where supermarkets are considered as the only retailer variable. The higher the share of food expenditures made in supermarkets, the higher is the consumption of ultra-processed and primary processed foods, and the lower is the consumption of unprocessed foods. These results are consistent with previous studies in Guatemala and Kenya showing that the use of supermarkets contributes to a shift from

[1] The results in Table 5 are single-equation OLS estimates. We also used SUR as an alternative estimator to account for possible correlation between the error terms. SUR results are shown in Table A6 in the Appendix. They are very similar to the OLS estimates, only that the SUR estimator cannot easily be combined with the cluster correction of standard errors.

the consumption of unprocessed to highly processed foods (Asfaw, 2008; Kimenju et al., 2015; Rischke et al., 2015). As mentioned, the consumption of ultra-processed foods was shown to be associated with increased risks of obesity and chronic diseases (Monteiro et al., 2010; Popkin, 2017).

[Insert Table 5]

The picture becomes more differentiated when also considering the other modern and traditional retailers, as shown in panel B of Table 5. The use of supermarkets (and hypermarkets) remains positively associated with the consumption of ultra-processed foods, and the size of the association is even larger than what we saw in panel A. An increase in the expenditure share of supermarkets by 1 percentage point increases the expenditure share of ultra-processed foods by about 0.2 percentage points. Modern convenience stores and fast-food restaurants are also associated with higher consumption of ultra-processed foods. Interestingly, however, the same is true for some of the traditional retailers. For traditional grocery stores and neighborhood kiosks the size of the positive association is even somewhat larger than for modern supermarkets and hypermarkets. These results suggest that there is a general shift towards the consumption of ultra-processed foods that cannot be attributed to modern retailers alone.

As a robustness check, we re-estimated the models in Table 5 by using absolute food expenditures for the three processing levels as dependent variables instead of expenditure shares. These alternative results also show that modern retailers as well as traditional grocery stores and kiosks are associated with higher consumption of ultra-processed foods (Table A7 in the Appendix). Furthermore, we estimated the same models by splitting the sample into poor and non-poor households, using the international poverty line of US$ 1.90 a day. Results in Table A8 suggest that the associations between the use of certain food retailers and the consumption of ultra-processed foods are more pronounced for non-poor than for poor households. This is

plausible given that poor households' food choices are more constrained by income limitations. However, as was shown above in Table 2, poor people also spend more than one-third of their food budget on ultra-processed foods.

4.5. Associations between retailers and food groups

Table 6 shows the associations between the use of different retailers and the consumption of various food groups. In these models, consumption is expressed in terms of the food quantities consumed by the household during the 7-day recall period. The upper part of Table 6 (panel A) includes supermarkets as the only retailer variable. The estimates suggest that the use of supermarkets is associated with higher consumption of meat, fish, and dairy products and lower consumption of sugar, sweets, and sweetened beverages.

[Insert Table 6]

However, the picture changes somewhat in the lower part of Table 6 (panel B), where the other retailers are also included as explanatory variables. The specifications in panel B show that the use of supermarkets and hypermarkets is associated with higher meat, fish, and dairy consumption, but also with higher consumption of sugar, sweets, and sweetened beverages. In addition, the use of modern convenience stores is associated with higher consumption of oils and fats. The higher consumption of animal-source products is likely related to better cooling facilities in modern retail outlets. This is generally positive from a dietary quality and nutrition perspective, as meat, fish, and dairy products are important sources of protein and

micronutrients.[2] However, more sugar, sweets, oils, and fats may contribute to overweight and obesity and therefore worsen dietary quality and nutrition. In other words, modern retailers seem to be associated with both positive and negative dietary effects.

Strikingly, however, mixed dietary effects are also observed for traditional retailers. On the positive side, the estimates in Table 6 suggest that the use of traditional grocery stores and neighborhood kiosks is associated with higher consumption of dairy products and eggs. The use of traditional markets is associated with higher vegetable consumption. On the negative side, the use of grocery stores, traditional markets, and neighborhood kiosks is associated with higher consumption of sugar, sweets, and sweetened beverages. The use of traditional markets is also associated with higher consumption of oils and fats. These patterns suggest that the retail format and the product ranges offered by different types of retailers influence consumer food choices and diets, yet without a clear division between modern and traditional retailers. This finding is in line with the analysis of links between food retailing and processing levels discussed above.

Another noteworthy observation from the estimates in Table 6 is that all retailers seem to be associated with lower consumption of fruits; several of these negative associations are statistically significant. This is surprising because consumers actually buy fresh fruits in several of the retail outlets, especially in supermarkets, traditional markets, and roadside markets. However, some of the fruits are also obtained from own production, and we do not include own production as an explanatory variable. Households with own fruit production consume more fruits than households that fully rely on purchases, which can explain the negative associations

[2] Table 2 showed that the mean consumption of meat and fish in the sample households is not very low. Very high meat consumption levels can also be associated with negative health and environmental externalities (Godfray et al., 2018).

between all retailers and fruit consumption in Table 6. Overall, the consumption of fruits is very low among the sample households from Lusaka City.

In a robustness check to the estimates in Table 6 we ran the same models but using consumption expressed in value terms instead of quantities as dependent variables. These alternative estimates are shown in Table A11 in the Appendix. The results support the same general conclusions only that the associations with consumption expenditures for sugar, sweets, and sweetened beverages are not statistically significant for any of the modern and traditional retailers.

5. Conclusion

Many countries in Africa are experiencing a rapid modernization of their food retail sector, with supermarkets, hypermarkets, modern convenience stores, and fast-food restaurants gaining in importance. These changing food environments, especially in urban areas, may influence consumers' food choices, dietary patterns, and nutrition. Previous research suggested that the spread of modern retailers may contribute to less healthy diets, higher consumption of ultra-processed foods, and rising rates of overweight and obesity. However, previous studies did not pay much attention to the question as to which socioeconomic groups use what type of retailers. Furthermore, the existing research on diet and nutrition effects focused primarily on the role of supermarkets, without accounting for the fact that most consumers obtain their foods from various types of retailers. We have added to this research direction by more explicitly analyzing the associations between household socioeconomic status, the use of different types of modern and traditional retailers, and dietary patterns. We have collected and used data from households in Lusaka City in Zambia, one of the places in Southern Africa where food environments have changed dramatically in recent years.

Our results show that almost all households use different types of retailers on a regular basis. Two-thirds of the households use modern and traditional retailers simultaneously. Among the modern retailers, supermarkets account for the largest share of the food purchases, followed by modern convenience stores and hypermarkets. Overall, modern retailers account for 42% of the household food expenditures on average, although with notable differences between poor and rich households. Modern retailers account for 20% and 63% of total food expenditures in the lowest and highest income tercile, respectively. Income is also an important predictor of the use of modern retailers after controlling for other socioeconomic variables. Other variables that increase the likelihood of using modern retailers are education, car ownership, having an office job, and female household heads. Especially supermarkets and hypermarkets offer a large variety of products, which consumers perceive as safe and of high quality. Supermarkets and hypermarkets also have longer and more reliable opening hours than most traditional retailers. All these factors make supermarkets and hypermarkets attractive shopping places especially for better-off households with high opportunity costs of time.

The regression analysis also shows that using supermarkets is associated with a higher consumption of ultra-processed foods and a lower consumption of unprocessed foods, also after controlling for income and other socioeconomic variables. This is in line with earlier research on the dietary effects of supermarkets (Asfaw, 2011; Rischke et al., 2015; Kimenju et al., 2015; Demmler et al., 2018; Rupa et al., 2019). From a nutrition and health perspective, these dietary trends are undesirable, as high consumption of ultra-processed foods is associated with increased risks of obesity and chronic diseases (Monteiro et al., 2010; Beatty et al., 2014; Steyn and Mchiza, 2014; Popkin, 2017). However, unlike earlier studies, we also analyzed the role of other retailers and found that especially the use of traditional grocery stores and neighborhood kiosks is also associated with higher consumption of ultra-processed foods. These results suggest that there

is a general shift towards the consumption of ultra-processed foods that cannot be attributed to modern retailers alone.

We also analyzed the consumption of different food groups and found that the use of modern retailers is associated with higher consumption of certain unhealthy food groups (sugar, sweets, oils, fats), but also with higher consumption of certain healthy food groups (meat, fish, dairy products). At the same time, the use of some of the traditional retailers — such as grocery stores, traditional markets, and kiosks — is also associated with higher consumption of unhealthy food groups.

Many countries in Africa are experiencing a nutrition transition with both positive and negative implications. On the positive side, the consumption of some nutritious foods is increasing. On the negative side, the consumption of sugar, fat, and salt is increasing as well. Changing food environments seem to influence and support these dietary trends and should therefore also be seen as potential entry points for public regulations and policies to support more healthy diets. Policy options to consider are regulations related to the advertisement and promotion of healthy and unhealthy foods and their strategic placement within shops. For instance, in studies referring to industrialized countries Glanz et al. (2012) and Payne and Niculescu (2018) showed that changes in the placement of fruits and vegetables can positively influence consumer choices. Related regulations could also be relevant for countries in Africa. In urban Zambia, the consumption of fresh fruits is particularly low; policies to increase fruit consumption levels would be useful. Beyond advertisement, awareness campaigns, and nudges, taxes and subsidies could also be options to promote healthy diets. A detailed discussion of policy approaches is beyond the scope of this article. In any case, our results underline that modern retailers are not the only drivers of dietary transitions, so that a focus on regulating modern retailers alone would be insufficient to promote healthy eating.

In closing, two limitations of our research should be briefly discussed. First, we used observational data and could not control for the endogeneity of households' decisions about which retailers to use. Therefore, our results are interpreted only in terms of associations, not as causal effects. Proper identification is difficult with observational data, but longer-term studies with panel data may possibly help. Second, results from Lusaka City in Zambia are not necessarily representative for other parts of Africa. Follow-up research in different geographical contexts would be interesting to further broaden the knowledge base.

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Table 1. Key characteristics of different food retailers in Lusaka City, Zambia.

Characteristic	Modern retailers				Traditional retailers			
	Hypermarket	Supermarket	Convenience store	Fast-food restaurant	Grocery store	Traditional market	Roadside market	Neighborhood kiosk
Typical location	Big shopping mall	Big shopping mall	Small shopping mall	Big shopping mall or gas station	Very small shopping mall	Traditional marketplace	Informal stall	Formal or informal stall
Floor space (m^2)	>200	100–200	<100	10–30	10–70	1–10	1–5	1–5
Modern cash tills	4–15	4–10	<4	<4	None	None	None	None
Service type	Self-service	Self-service	Self-service	Pressing order	Over the counter	Over the counter	Over the counter	Over the counter
Credit facility	No	No	No	No	Possible	Possible	Possible	Possible
Promotions via media	Often	Often	Often	Often	Very rare	No	No	No
Price discounts	Occasional (e.g., month ends)	Occasional (e.g., month ends)	Occasional (e.g., month ends)	Occasional (e.g., month ends)	Very rare	No	No	No
Price negotiation	No	No	No	No	No	Often	Often	Often
Product range	Large variety of food and non-food products	Large variety of food and non-food products	Limited variety of food and non-food products	Only fast food products and beverages	Limited variety of food products	Fairly large variety of legumes, cereals, vegetables	Fairly large variety of fruits and vegetables	Fairly large variety of legumes, cereals, vegetables
	Large variety of fruits and vegetables	Large variety of fruits and vegetables	Limited variety of fruits and vegetables	Limited variety of vegetables				
	Frozen, canned, and cooked food	Frozen, canned, and cooked food	Limited variety of frozen and canned food				Sometimes cooked food	
Packaging size	Small to very large	Small to very large	Small to very large	Small to very large	Small to large	Very small to small	Very small to small	Very small to small
Repacking	No	No	No	No	No	Often	Often	Often
Key actors (examples)	Game Stores, Cheers, Choppies	Shoprite, PicknPay, Food Lover's, Spurs	Numerous	Hungry Lion, Debonairs Pizza, KFC, KEG	Numerous	Soweto, Compound Markets	Numerous	Numerous

Table 2. Socioeconomic characteristics and food consumption patterns.

	Full sample	By income tercile		
		Lowest	Middle	Highest
Socioeconomic characteristics				
Household income (US$/year)	10691.40	1855.67	7548.14	22920.93
	(12163.16)	(1036.68)	(2134.58)	(14347.06)
Household size (members)	4.52	4.53	4.47	4.56
	(1.63)	(1.79)	(1.66)	(1.43)
Male household head (dummy)	0.53	0.46	0.49	0.65
	(0.50)	(0.50)	(0.50)	(0.48)
Education of household head (dummy)	12.03	9.48	11.88	14.77
	(3.93)	(3.62)	(3.46)	(2.71)
Office job (dummy, any household member)	0.45	0.10	0.51	0.74
	(0.50)	(0.30)	(0.50)	(0.44)
Car ownership (dummy)	0.28	0.03	0.21	0.60
	(0.45)	(0.16)	(0.41)	(0.49)
Food consumption				
Cereals and tubers (kg/week)	11.88	11.23	11.45	12.97
	(5.20)	(5.48)	(4.56)	(5.38)
Legumes (kg/week)	1.22	1.27	1.34	1.03
	(1.59)	(1.55)	(1.83)	(1.34)
Fruits (kg/week)	0.28	0.22	0.26	0.37
	(0.82)	(0.73)	(0.83)	(0.89)
Vegetables (kg/week)	4.22	4.36	4.57	3.70
	(3.74)	(3.78)	(3.87)	(3.52)
Meat and fish (kg/week)	4.81	3.38	4.85	6.24
	(3.45)	(2.86)	(3.24)	(3.64)
Dairy products (kg/week)	0.61	0.25	0.48	1.11
	(1.27)	(0.65)	(1.01)	(1.74)
Eggs (kg/week)	0.44	0.28	0.34	0.69
	(0.77)	(0.64)	(0.67)	(0.92)
Oils and fats (kg/week)	0.69	0.65	0.72	0.70
	(0.60)	(0.58)	(0.60)	(0.62)
Sugar, sweetened beverages (kg/week)	1.68	1.28	1.65	2.13
	(2.59)	(1.99)	(2.31)	(3.26)
Food expenditures				
Total weekly food expenditure (ZMW/capita)	112.46	96.32	115.61	125.69
	(62.98)	(65.99)	(59.37)	(60.18)
Unprocessed foods (%)	0.25	0.29	0.25	0.20
	(0.14)	(0.16)	(0.13)	(0.12)
Primary processed foods (%)	0.40	0.35	0.40	0.45
	(0.17)	(0.18)	(0.17)	(0.15)
Ultra-processed foods (%)	0.35	0.36	0.35	0.35
	(0.14)	(0.14)	(0.14)	(0.12)
Observations	475	159	160	156

Notes: Mean values are shown with standard deviations in parentheses. ZMW, Zambia Kwacha (local currency). The average exchange rate was ZMW 9.87 = US$ 1 in mid-2018. Descriptive statistics of additional variables are shown in Table A3 in the Appendix.

Table 3. Proportion of households using different modern and traditional retailers.

	Full sample	By income tercile		
		Lowest	Middle	Highest
Modern retailers				
Hypermarkets	0.05	0.01	0.04	0.12
Supermarkets	0.73	0.48	0.78	0.92
Convenience store	0.12	0.12	0.09	0.16
Fast-food restaurant	0.02	0.01	0.01	0.04
Traditional retailers				
Grocery stores	0.45	0.64	0.43	0.28
Traditional market	0.73	0.70	0.74	0.74
Roadside market	0.36	0.54	0.33	0.20
Neighborhood kiosk	0.20	0.17	0.20	0.23
Observations	475	159	160	156

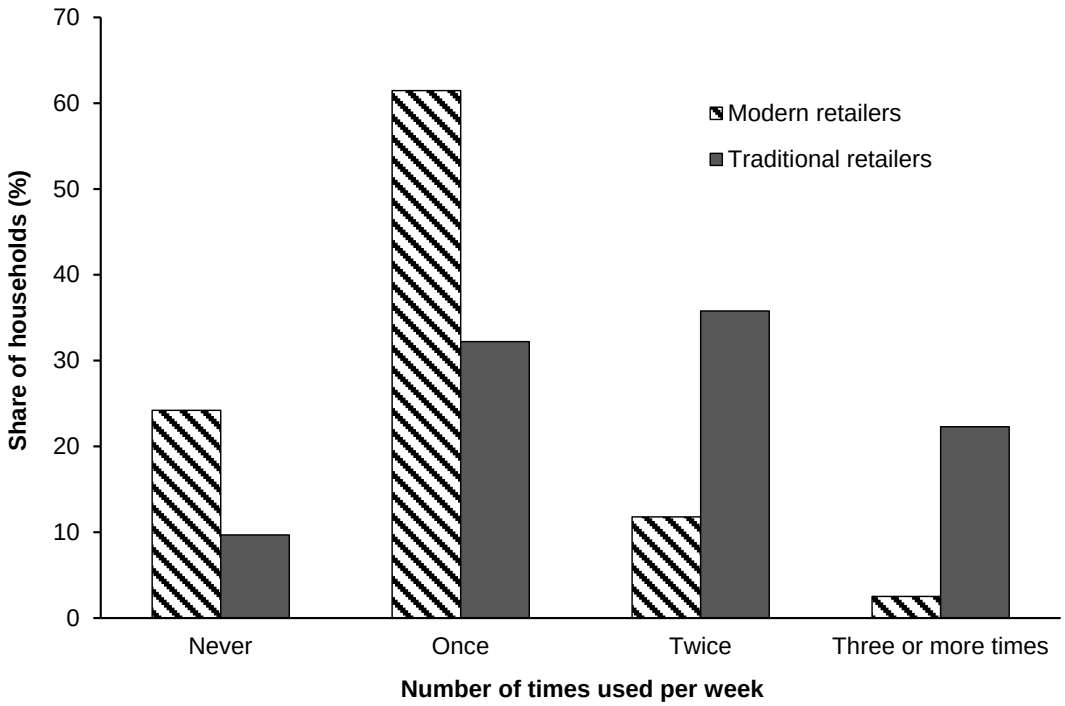

Figure 1. Frequency of use of modern and traditional retailers in Lusaka City.

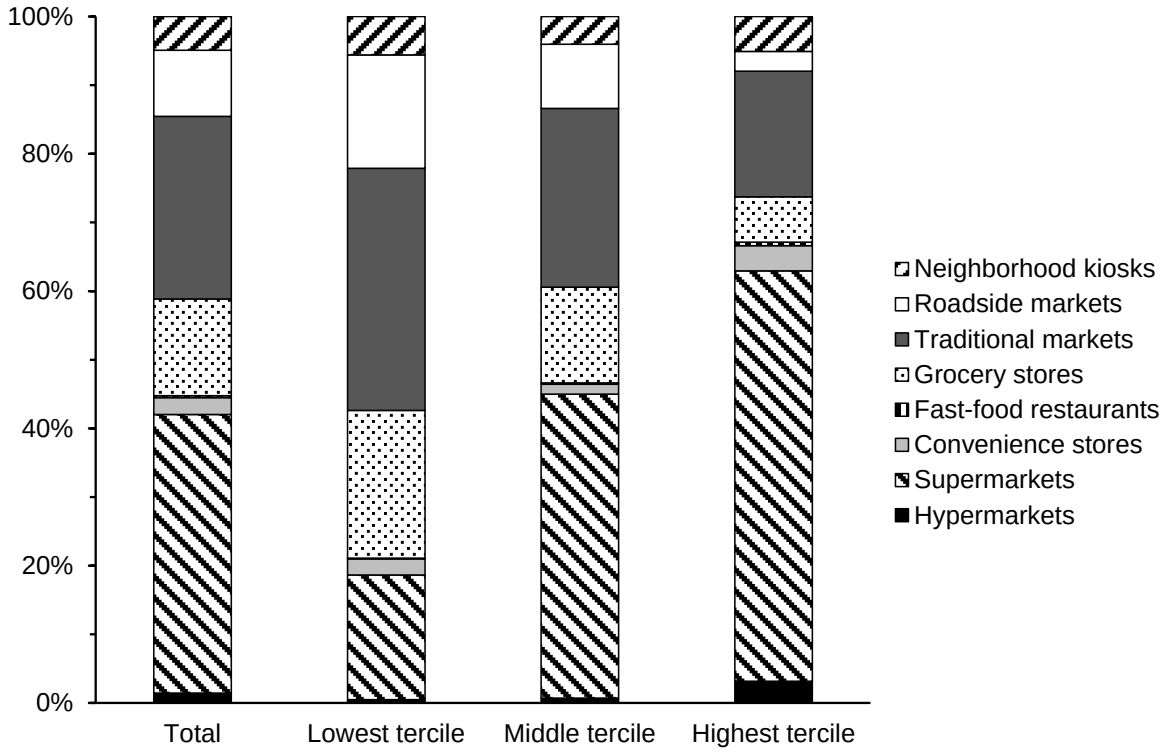

Figure 2. Household food expenditure shares spent in different retail outlets in Lusaka City.

Table 4. Factors influencing the use of different food retailers (multivariate probit model).

	Modern retailers				Traditional retailers			
	Hyper-market	Supermarket	Convenience store	Fast-food restaurant	Grocery store	Traditional market	Roadside market	Neighborhood kiosk
Income (log)	0.031**	0.063***	0.027	0.011	–0.045**	0.015	–0.043**	0.072***
	(0.015)	(0.017)	(0.018)	(0.009)	(0.022)	(0.022)	(0.021)	(0.022)
Household size	–0.004	–0.031**	0.019*	0.009*	0.054***	0.017	0.044***	–0.001
	(0.009)	(0.012)	(0.011)	(0.005)	(0.016)	(0.016)	(0.015)	(0.026)
Education (years)	–0.002	0.025***	–0.007	0.006**	–0.021***	0.0003	–0.028***	–0.012*
	(0.005)	(0.006)	(0.005)	(0.003)	(0.007)	(0.007)	(0.007)	(0.006)
Age (years)	0.0003	0.00008	0.001	–0.001	–0.002	–0.001	–0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Male (dummy)	0.007	–0.088**	0.022	–0.008	0.105**	0.009	0.168***	0.091**
	(0.023)	(0.035)	(0.032)	(0.015)	(0.044)	(0.041)	(0.043)	(0.038)
Office job (dummy)	0.004	0.109**	–0.015	–0.033*	–0.072	0.123**	–0.125**	–0.100**
	(0.027)	(0.043)	(0.038)	(0.018)	(0.052)	(0.053)	(0.051)	(0.046)
Car ownership (dummy)	0.054**	0.157***	0.086**	0.010	–0.124**	–0.113**	0.008	–0.012
	(0.024)	(0.058)	(0.038)	(0.017)	(0.056)	(0.054)	(0.054)	(0.048)
Adolescents (dummy)	0.014	0.053	–0.003	0.010	–0.017	0.050	–0.060	0.043
	(0.022)	(0.037)	(0.034)	(0.015)	(0.046)	(0.045)	(0.045)	(0.040)
Children (dummy)	–0.002	–0.019	0.015	0.011	0.030	0.061	0.009	0.016
	(0.022)	(0.040)	(0.034)	(0.016)	(0.048)	(0.046)	(0.046)	(0.042)
Chewa (dummy)	–0.035	–0.011	–0.008	–0.176	0.107*	–0.024	–0.098	0.007
	(0.047)	(0.050)	(0.048)	(6.286)	(0.064)	(0.063)	(0.062)	(0.055)
Tonga (dummy)	0.058**	–0.118**	0.067	0.008	0.005	0.005	–0.057	–0.008
	(0.024)	(0.048)	(0.041)	(0.017)	(0.058)	(0.060)	(0.056)	(0.050)
Catholic (dummy)	0.039*	–0.089**	0.052	0.020	0.078	0.036	–0.041	0.067
	(0.023)	(0.039)	(0.033)	(0.016)	(0.049)	(0.047)	(0.047)	(0.041)
Seventh Day Adventist (dummy)	–0.017	0.031	–0.059	0.001	0.010	0.083	–0.049	–0.007
	(0.028)	(0.053)	(0.049)	(0.014)	(0.060)	(0.063)	(0.059)	(0.058)

Notes: Average marginal effects are shown with standard errors in parenthesis. Number of observations=475. Log pseudo likelihood=–1460, and Wald χ^2 (104) =364. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 5. Associations between the use of different retailers and food processing levels.

	Ultra-processed foods (expenditure share, %)	Primary processed foods (expenditure share, %)	Unprocessed foods (expenditure share, %)
	Panel A: Only supermarkets considered		
Supermarket	0.051**	0.043*	–0.094***
	(0.022)	(0.021)	(0.027)
Other covariates	Yes	Yes	Yes
	Panel B: Multiple food retailers considered		
Hypermarket	0.146*	–0.018	–0.128
	(0.071)	(0.095)	(0.091)
Supermarket	0.196***	–0.053	–0.143*
	(0.052)	(0.075)	(0.075)
Convenience store	0.293***	–0.267**	–0.026
	(0.091)	(0.110)	(0.097)
Fast-food restaurant	0.611***	–0.671***	0.060
	(0.109)	(0.091)	(0.168)
Grocery store	0.217***	–0.043	–0.174**
	(0.055)	(0.070)	(0.066)
Traditional market	0.063	–0.122*	0.058
	(0.044)	(0.063)	(0.070)
Roadside market	0.041	–0.164**	0.122*
	(0.054)	(0.061)	(0.063)
Neighborhood kiosk	0.274***	–0.101	–0.173*
	(0.079)	(0.093)	(0.098)
Other covariates	Yes	Yes	Yes
Observations	475	475	475

Notes: Ordinary least squares estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. Socioeconomic control variables are included in all models, but are not shown here for brevity. Full estimation results are shown in Table A5 in the Appendix. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 6. Associations between the use of different retailers and the consumption of selected food groups.

	Food quantity (kg/week)								
	Cereals and tubers	Legumes	Fruits	Vegetables	Meat and fish	Dairy products	Eggs	Oils and fats	Sugar, beverages
				Panel A: Only supermarkets considered					
Supermarket	–0.003	–0.001	–0.005	–0.001	0.015***	0.014*	–0.002	–0.003	–0.010***
	(0.006)	(0.005)	(0.004)	(0.009)	(0.006)	(0.007)	(0.001)	(0.002)	(0.004)
Other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
				Panel B: Multiple food retailers considered					
Hypermarket	0.025	–0.009	–0.009	0.013	0.043*	0.053*	0.007	0.009	0.040***
	(0.031)	(0.019)	(0.018)	(0.020)	(0.023)	(0.029)	(0.006)	(0.005)	(0.008)
Supermarket	0.011	0.003	–0.031**	0.027	0.030*	0.055***	0.005	0.005	0.015*
	(0.018)	(0.012)	(0.015)	(0.021)	(0.016)	(0.020)	(0.003)	(0.004)	(0.008)
Convenience store	0.058**	–0.007	–0.039*	0.012	0.022	0.014	0.002	0.014**	0.020
	(0.025)	(0.011)	(0.023)	(0.019)	(0.015)	(0.050)	(0.005)	(0.006)	(0.013)
Fast-food restaurant	–0.100***				0.110*	0.132**			0.105**
	(0.037)				(0.062)	(0.055)			(0.049)
Grocery store	0.013	–0.003	–0.030*	0.016	0.026	0.063**	0.008**	0.005	0.028***
	(0.016)	(0.013)	(0.017)	(0.023)	(0.016)	(0.029)	(0.004)	(0.004)	(0.007)
Traditional market	0.011	0.016	–0.033**	0.058***	0.015	0.023	0.004	0.011***	0.024***
	(0.018)	(0.013)	(0.015)	(0.015)	(0.015)	(0.022)	(0.003)	(0.004)	(0.008)
Roadside market	0.010	0.012	–0.038**	0.038**	0.007	0.038**	0.006	0.005	0.010
	(0.019)	(0.013)	(0.018)	(0.016)	(0.016)	(0.015)	(0.004)	(0.004)	(0.007)
Neighborhood kiosk	0.030	–0.013	–0.014	–0.008	–0.010	0.057**	0.017***	0.007	0.027*
	(0.027)	(0.015)	(0.017)	(0.025)	(0.019)	(0.027)	(0.004)	(0.005)	(0.015)
Other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	475	475	475	475	475	475	475	475	475

Notes: Tobit estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. Socioeconomic control variables are included in all models, but are not shown here for brevity. Full estimation results are shown in Tables A9 and A10 in the Appendix. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

APPENDIX

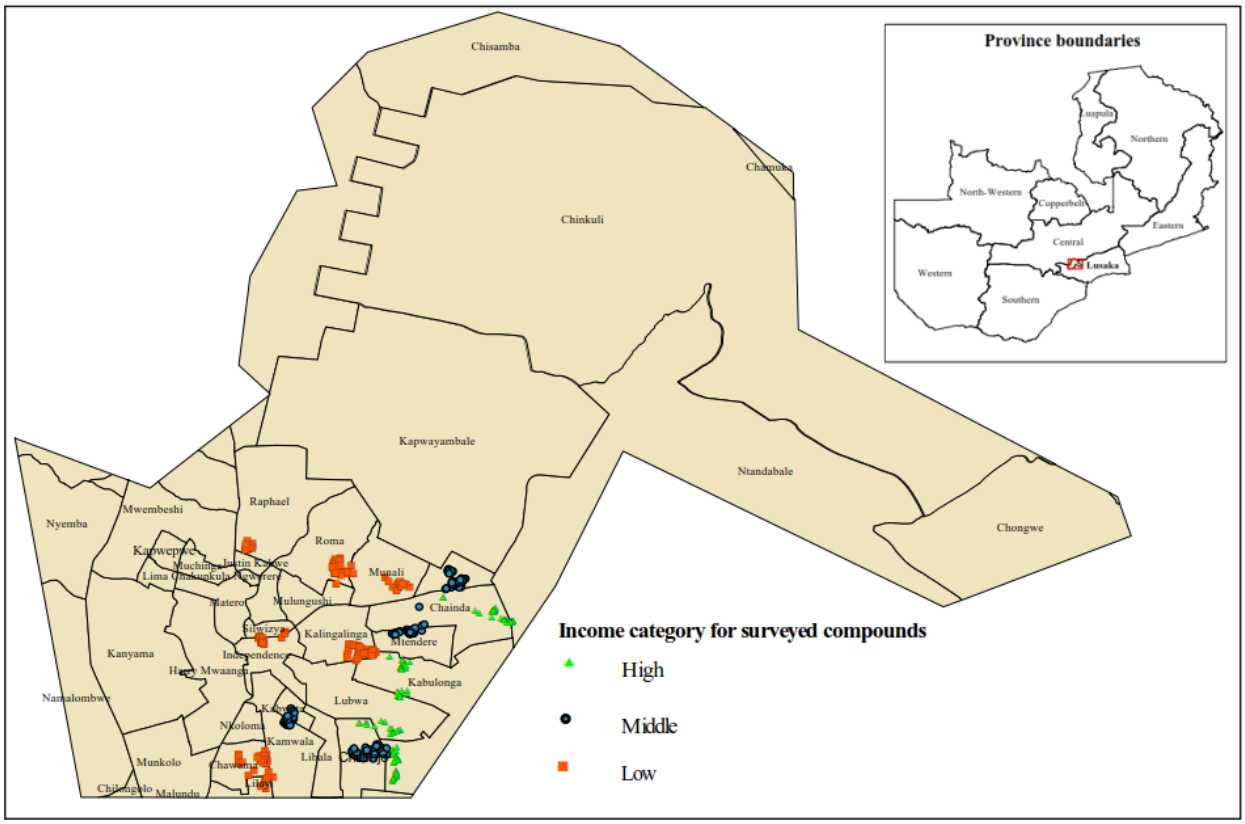

Figure A1. Map of Lusaka City with sampled compounds and households.

Table A1. List of main shopping malls with modern food retailers in Lusaka City.

No.	Name of shopping mall	Location and surrounding *compounds*	Modern food retailers: hypermarkets, supermarkets (fast-food restaurants in parentheses)
1	Arcades	Roma, University of Zambia (UNZA)	Spurs
2	Cairo	Central Lusaka	Shoprite (Food Fayre, Hungry Lion, Machachos)
3	Chawama	Chawama, John Haward, Kuku	Spur
4	Chazanga Shoprite	Chazanga, SOS	Shoprite
5	Chilenje Shoprite	Chalala, Chilenje, Woodlands	Choppies, Shoprite (Debonairs Pizza, MM Chickens, Naaz)
6	Choppies Complex	Kabulonga, Sundel, Zamtel Flats	Choppies
7	Cosmopolitan	Chawama, John Howard, Jon-Lengi, Makeni, Misisi	Game Stores, Shoprite (Chicken Inn, Galito's, Hungry Lion, Mochachos, Pizza Hut)
8	Cross Roads	Cross Road, Kabulonga, Nyumba Yanga, Sundel	Spurs (Gigibonta, Major Meat)
9	Down Town	Chibolya, Jon-Lengi, Kabwata, Kamwala, Misisi	Spurs (Big Bite, Debonairs Pizza, Down Town Foods)
10	East Park	Childley, Kalingalinga, Kalundu, Ng'ombe, Roma, UNZA	Food Lover's, PicknPay (Fishaways, Gigibonta, GoatnChips, Hungry Lion, KEG, Pizza Hut)
11	Embassy	Chawama, Jon-Lengi, Makeni, Misisi	Embassy, Spurs (Papas, Piatto, Zorbas)
12	Garden City	Avondole, Chelston	Food Lover's, PicknPay (Bushman, Foodano)
13	Kabulonga and Melissa	Kabulonga	Melissa, PicknPay (Debonairs Pizza, KFC, Nando's, Subway)
14	Levy Junction	Central Lusaka, Chilulu, Evelyn Home College, Gardens, Nippa, North Mead, Roads Park, Thorn Park	Food Lover's, PicknPay (Chicken Inn, Hungry Lion, KFC, Pizza Inn, Wimpy)
15	Makeni	Chawama, Jon-Lengi, Makeni, Misisi	Food Lover's, PicknPay (Debonairs Pizza, KFC, Nando's)
16	Mama Betty Foxydale	Ngo'mbe, Roma	Spur (Debonairs Pizza, Gigibonta)
17	Manda Hill	Central Lusaka, Chilulu, Gardens, Longacres, Olympia, Roads Park	Shoprite, Game Stores (Bread Café, Debonairs Pizza, Galito's, Hungry Lion, Mugg and Bean, My Asia, Nando's, Pizza Inn, Steers, Subway, Vasila)
18	Matero	Matero	Shoprite (Hungry Lion)
19	Novara Great North	Chazanga, SOS	PicknPay (GoatnChips, Hungry Lion)
20	PHI	Kaunda Square, PHI, Mtendere	PicknPay (Debonairs Pizza, King-Pie)
21	SOS Spurs	Chazanga, SOS	Spur
22	Twin Palm	Avondole, Chelston, Ibex, Salama Park	Shoprite (Chicken Inn, Debonairs Pizza, Hungry Lion)
23	Waterfalls	Avondole, Chelston	Shoprite (Gigibonta, Hungry Lion)
24	Woodlands	Chilenje, Kabulonga, Woodlands	PicknPay (Creamy, Debonairs Pizza, Galito's, Nachies, O. Hagans, Pizza Inn)
25	Zappa	Chawama	(Debonairs Pizza)

Notes: The main shopping malls that were operating in 2018 are included. Very small shopping malls are not included. Likewise, malls that were still under construction in 2018 are not included. The list was compiled by the authors based on internet search, personal visits, and key informant interviews.

Table A2. Food processing levels by food groups and items.

Processing level	Food group	Food items (examples)
Unprocessed foods	Cereals and tubers	Maize (dry/green), cassava, Irish potato, sweet potato, yams
	Eggs and milk	Eggs, fresh whole milk
	Fruits	Apples, avocado, banana (ripe/boiled), guava, mango, pawpaw, pineapple, pumpkin, orange/tangerine, sugar plum, watermelon
	Legumes	Bean (fresh/dry), cowpea (fresh/dry), groundnut (fresh/dry), pigeonpea (fresh/dry), soybean, velvet bean
	Vegetables	Bean leaves, blackjack, cabbage, carrot, cassava leaves, cowpea leaves, cucumber, eggplant, garlic, greengram, lettuce, mushroom (cultivated/wild), okra, onion, pepper, pumpkin leaves, rape/mustard/chinese, tomato
Primary processed foods	Drinks and snacks	Bottled/clear beer, bottled water, roasted cashew/macadamia nuts
	Meat and fish	Beef, bush/game meat, chicken, duck, turkey, goat meat, sheep meat, pork, fish (fresh/frozen/dried)
	Cereals	Rice, millet, oats, sorghum
Ultra-processed foods	Bread and pasta	Bread, buns, pasta, instant noodles
	Cereals and tubers	Maize flour, cornflakes, porridge mix, wheat flour, cassava flour
	Dairy products	Cheese, milk, yoghurt
	Oils and fats	Butter/margarine, coconut oil, cooking oil/fat
	Meat and fish	Sausage (beef/chicken/pork), soya meat, canned meat and fish
	Miscellaneous	Canned foods, mandazi, mixed fruits/salads, pizza, samosa, ready-made foods/dishes
	Sugar, sweetened drinks and snacks	Soft drinks, sweetened fruit juices, wine, jam, tomato sauce, salt, sugar, biscuits/cookies, cake, chips, chocolate, crisps, puffed salted corn chips, popcorn, salted nuts

Note: The same classifications of foods were also used by Demmler et al. (2018).

Table A3. Additional descriptive statistics.

	Full sample	By income tercile		
		Lowest	Middle	Highest
Socioeconomic characteristics				
Age of household head (years)	43.83	45.13	41.98	44.40
	(12.86)	(13.67)	(12.68)	(12.02)
Adolescent in household (dummy)	0.47	0.50	0.49	0.43
	(0.50)	(0.50)	(0.50)	(0.50)
Child in household (dummy)	0.59	0.71	0.53	0.54
	(0.49)	(0.45)	(0.50)	(0.50)
Bemba ethnicity (dummy)	0.29	0.28	0.24	0.36
	(0.45)	(0.45)	(0.43)	(0.48)
Tonga ethnicity (dummy)	0.19	0.15	0.21	0.21
	(0.39)	(0.36)	(0.41)	(0.41)
Protestant religion (dummy)	0.42	0.42	0.46	0.38
	(0.49)	(0.49)	(0.50)	(0.49)
Catholic religion (dummy)	0.26	0.31	0.19	0.29
	(0.44)	(0.47)	(0.39)	(0.45)
Food expenditures				
Cereals and tubers (ZMW/week)	106.41	87.37	108.25	123.94
	(57.02)	(49.60)	(55.01)	(60.40)
Legumes (ZMW/week)	30.15	30.84	32.36	27.16
	(43.99)	(43.52)	(49.17)	(38.63)
Fruits (ZMW/week)	7.88	7.23	6.75	9.70
	(20.64)	(20.94)	(17.37)	(23.25)
Vegetables (ZMW/week)	59.63	57.99	64.98	55.82
	(44.19)	(39.59)	(47.19)	(45.21)
Meat and fish (ZMW/week)	172.84	126.04	178.54	214.69
	(116.61)	(100.16)	(107.59)	(124.26)
Dairy products and eggs (ZMW/week)	23.53	14.45	18.54	37.90
	(33.24)	(18.70)	(25.32)	(45.25)
Oils and fats (ZMW/week)	9.82	9.14	10.28	10.05
	(9.47)	(8.65)	(9.09)	(10.61)
Sugar, sweetened beverages (ZMW/week)	33.86	27.55	32.23	41.96
	(50.67)	(42.59)	(43.95)	(62.54)
Observations	475	159	160	156

Notes: Mean values are shown with standard deviations in parentheses. ZMW, Zambia Kwacha (local currency). The average exchange rate was ZMW 9.87 = US$ 1 in mid-2018.

Table A4. Correlation matrix from multivariate probit model.

	Modern retailer				Traditional retailer			
	HM	SM	CS	FF	GS	TM	RM	NK
Hypermarket (HM)	1.000							
Supermarket (SM)	0.161	1.000						
	(0.122)							
Convenience store (CS)	0.252**	0.149	1.000					
	(0.114)	(0.099)						
Fast-food restaurant (FF)	−0.088	–0.047	0.198	1.000				
	(0.236)	(0.220)	(0.205)					
Grocery store (GS)	−0.098	–0.304***	0.009	0.388***	1.000			
	(0.108)	(0.073)	(0.090)	(0.122)				
Traditional market (TM)	0.074	–0.164*	0.064	–0.046	0.022	1.000		
	(0.108)	(0.084)	(0.091)	(0.127)	(0.080)			
Roadside market (RM)	0.060	–0.040	0.163*	0.285**	0.249***	–0.282***	1.000	
	(0.105)	(0.086)	(0.091)	(0.124)	(0.076)	(0.081)		
Neighborhood kiosk (NK)	−0.003	–0.145*	–0.086	0.137	0.222***	–0.124	–0.026	1.000
	(0.117)	(0.086)	(0.096)	(0.114)	(0.081)	(0.086)	(0.083)	

Notes: Correlation coefficients are shown with standard errors in parentheses. The likelihood ratio test of zero correlation between the error terms is rejected at the 1% level; χ^2 (28) =85. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A5. Associations between the use of retailers and food processing levels (full results).

	Only supermarkets considered			Multiple food retailers considered		
	Ultra-processed foods	Primary processed foods	Unprocessed foods	Ultra-processed foods	Primary processed foods	Unprocessed foods
	(1)	(2)	(3)	(1)	(2)	(3)
Hypermarket				0.146*	–0.018	–0.128
				(0.071)	(0.095)	(0.091)
Supermarket	0.051**	0.043*	–0.094***	0.196***	–0.053	–0.143*
	(0.022)	(0.021)	(0.027)	(0.052)	(0.075)	(0.075)
Convenience store				0.293***	–0.267**	–0.026
				(0.091)	(0.110)	(0.097)
Fast-food restaurant				0.611***	–0.671***	0.060
				(0.109)	(0.091)	(0.168)
Grocery store				0.217***	–0.043	–0.174**
				(0.055)	(0.070)	(0.066)
Traditional market				0.063	–0.122*	0.058
				(0.044)	(0.063)	(0.070)
Roadside market				0.041	–0.164**	0.122*
				(0.054)	(0.061)	(0.063)
Neighborhood kiosk				0.274***	–0.101	–0.173*
				(0.079)	(0.093)	(0.098)
Male	–0.174	–0.374	0.548	–0.648	–0.313	0.961
	(1.404)	(1.996)	(1.911)	(1.221)	(1.939)	(1.646)
Age	0.001	–0.057	0.056	0.015	–0.071	0.056*
	(0.050)	(0.039)	(0.050)	(0.039)	(0.043)	(0.027)
Household size	0.707*	–1.254***	0.547	0.875**	–1.063**	0.188
	(0.363)	(0.404)	(0.445)	(0.333)	(0.433)	(0.304)
Education	–0.550***	0.700***	–0.150	–0.601***	0.673***	–0.072
	(0.122)	(0.214)	(0.168)	(0.126)	(0.198)	(0.182)
Income (log)	0.159	1.389*	–1.548**	–0.440	1.297*	–0.857
	(0.423)	(0.714)	(0.621)	(0.458)	(0.712)	(0.599)
Chewa	0.089	2.757	–2.846	–0.241	2.327	–2.086
	(1.643)	(2.022)	(2.565)	(1.589)	(2.188)	(2.212)
Tonga	0.544	1.406	–1.950	–0.001	1.319	–1.318
	(1.608)	(2.057)	(1.553)	(1.698)	(2.208)	(1.581)
Catholic	–0.977	–0.171	1.148	–1.150	–0.697	1.847**
	(2.111)	(1.847)	(0.963)	(2.064)	(1.968)	(0.713)
Seventh Day Adventist	–2.916	0.252	2.664*	–2.075	0.570	1.505
	(1.719)	(1.770)	(1.441)	(1.566)	(1.985)	(1.413)
Constant	35.601***	22.579***	41.820***	29.124***	33.773***	37.103***
	(5.417)	(5.688)	(5.499)	(7.932)	(8.944)	(9.491)
R-squared	0.035	0.122	0.146	0.116	0.149	0.256
Observations	475	475	475	475	475	475

Note: Ordinary least squares estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A6. Associations between supermarket use and food processing levels (seemingly unrelated regressions).

	Ultra-processed foods (expenditure share)	Primary processed foods (expenditure share)	Unprocessed foods (expenditure share)
Supermarket	0.051**	0.043	–0.094***
	(0.023)	(0.028)	(0.023)
Male	–0.174	–0.374	0.548
	(1.318)	(1.593)	(1.299)
Age	0.001	–0.057	0.056
	(0.051)	(0.061)	(0.050)
Household size	0.707*	–1.254**	0.547
	(0.412)	(0.497)	(0.406)
Education	–0.550**	0.700***	–0.15
	(0.219)	(0.264)	(0.216)
Income (log)	0.159	1.389*	–1.548**
	(0.645)	(0.780)	(0.636)
Chewa	0.089	2.757	–2.846
	(1.932)	(2.335)	(1.905)
Tonga	0.544	1.406	–1.95
	(1.756)	(2.122)	(1.731)
Catholic	–0.977	–0.171	1.148
	(1.474)	(1.781)	(1.453)
Seventh Day Adventist	–2.916	0.252	2.664
	(1.865)	(2.254)	(1.839)
Constant	35.601***	22.579***	41.820***
	(6.492)	(7.845)	(6.401)
Observations	475	475	475

Note: Seemingly unrelated regression estimates are shown with standard errors in parentheses. Supermarkets are represented by the household expenditure share for this retailer. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A7. Associations between the use of different retailers and food processing levels (absolute expenditures).

	Ultra-processed foods (expenditures, log)	Primary processed foods (expenditures, log)	Unprocessed foods (expenditures, log)
	Panel A: Supermarkets only		
Supermarket	0.002	0.002	–0.004*
	(0.001)	(0.001)	(0.002)
Other covariates	Yes	Yes	Yes
	Panel B: Multiple food retailers considered		
Hypermarket	0.012***	0.007*	0.006
	(0.004)	(0.004)	(0.006)
Supermarket	0.009**	0.003	0.000
	(0.003)	(0.003)	(0.006)
Convenience store	0.014***	–0.003	0.009
	(0.005)	(0.003)	(0.006)
Fast-food restaurant	0.041***	0.000	0.029***
	(0.006)	(0.012)	(0.006)
Grocery store	0.009**	0.001	–0.002
	(0.003)	(0.003)	(0.006)
Traditional market	0.006*	0.002	0.011**
	(0.003)	(0.003)	(0.005)
Roadside market	0.003	–0.002	0.010**
	(0.003)	(0.003)	(0.004)
Neighborhood kiosk	0.010**	0.000	–0.004
	(0.004)	(0.003)	(0.006)
Other covariates	Yes	Yes	Yes
Observations	475	469	471

Notes: Ordinary least squares estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. The same socioeconomic control variables are included as in Table A5. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A8. Associations between the use of different retailers and food processing levels (by poverty status).

	Poor households		Non-poor households	
	Ultra-processed (exp. share, %)	Unprocessed (exp. share, %)	Ultra-processed (exp. share, %)	Unprocessed (exp. share, %)
Panel A: Only supermarkets considered				
Supermarket only	0.031	–0.058	0.057**	–0.111***
	(0.050)	(0.087)	(0.026)	(0.025)
Other covariates	Yes	Yes	Yes	Yes
Panel B: Multiple food retailers considered				
Hypermarket			0.165**	–0.118
			(0.060)	(0.087)
Supermarket	0.035	–0.165	0.231***	–0.144
	(0.128)	(0.205)	(0.047)	(0.095)
Convenience store	0.274*	0.114	0.329**	–0.076
	(0.130)	(0.187)	(0.111)	(0.125)
Fast-food restaurant	–0.627	–1.055	0.679***	0.071
	(0.853)	(1.003)	(0.081)	(0.219)
Grocery store	0.009	–0.165	0.269***	–0.225*
	(0.118)	(0.163)	(0.052)	(0.106)
Traditional market	–0.029	–0.022	0.064	0.106
	(0.098)	(0.151)	(0.048)	(0.084)
Roadside market	–0.073	0.020	0.056	0.158*
	(0.075)	(0.147)	(0.067)	(0.084)
Neighborhood kiosk	0.040	–0.375**	0.358***	–0.067
	(0.147)	(0.165)	(0.053)	(0.123)
Other covariates	Yes	Yes	Yes	Yes
Observations	126	126	349	349

Notes: Ordinary least squares estimates are shown with cluster-corrected standard errors in parentheses. Poor households are those with less than US$1.90 per capita and day in purchasing power parity terms. All types of retailers are represented by the household expenditure share for this retailer. For poor households, hypermarkets were dropped due to perfect collinearity. The same socioeconomic control variables are included as in Table A5. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A9. Associations between the use of different retailers and the consumption of selected food groups (full results, supermarkets only).

	Household food consumption (kg/week)								
	Cereals and tubers	Legumes	Fruits	Vegetables	Meat and fish	Dairy products	Eggs	Oils and fats	Sugar, beverages
Supermarket	–0.003	–0.001	–0.005	–0.001	0.015***	0.014*	–0.002	–0.003	–0.010***
	(0.006)	(0.005)	(0.004)	(0.009)	(0.006)	(0.007)	(0.001)	(0.002)	(0.004)
Male	0.281	0.646***	–0.031	0.627	0.361	–0.072	0.122	0.397***	0.150
	(0.471)	(0.160)	(0.338)	(0.483)	(0.245)	(0.552)	(0.083)	(0.085)	(0.167)
Age	0.026	0.006	0.006	–0.007	–0.003	0.011	0.002	0.008***	0.019***
	(0.021)	(0.007)	(0.012)	(0.014)	(0.008)	(0.019)	(0.004)	(0.003)	(0.006)
Household size	0.907***	0.233***	–0.074	0.384***	0.145**	0.278	–0.017	0.052*	0.121
	(0.137)	(0.078)	(0.072)	(0.112)	(0.072)	(0.211)	(0.020)	(0.029)	(0.098)
Education	0.042	0.032	0.067*	–0.038	0.150***	0.121	0.050**	–0.017*	0.103***
	(0.048)	(0.031)	(0.037)	(0.065)	(0.043)	(0.097)	(0.020)	(0.010)	(0.022)
Income (log)	0.441**	–0.203	0.142	–0.205	0.445**	0.844***	0.121***	0.083**	0.217
	(0.203)	(0.139)	(0.133)	(0.210)	(0.174)	(0.286)	(0.044)	(0.038)	(0.134)
Chewa	0.933*	0.589	0.128	–0.422	0.790**	–0.619	0.065	0.468***	0.517
	(0.555)	(0.361)	(0.328)	(0.719)	(0.309)	(0.707)	(0.126)	(0.098)	(0.360)
Tonga	0.269	0.438**	–0.402	1.042**	0.581*	0.344	0.037	0.249***	–0.095
	(0.518)	(0.197)	(0.296)	(0.497)	(0.327)	(0.513)	(0.159)	(0.067)	(0.219)
Catholic	0.107	0.172	0.309	0.545	–0.327	–0.288	0.121	–0.030	0.007
	(0.386)	(0.252)	(0.305)	(0.554)	(0.345)	(0.344)	(0.087)	(0.086)	(0.205)
Seventh Day Adventist	0.964**	0.367	0.632***	0.704	–0.465	0.363	–0.114	0.165**	–0.295
	(0.393)	(0.272)	(0.232)	(0.588)	(0.444)	(0.512)	(0.132)	(0.077)	(0.218)
Constant	–0.035	0.813	–3.536*	4.512**	–3.650**	–15.110***	–1.964***	–1.043**	–3.487**
	(2.355)	(1.145)	(2.017)	(2.238)	(1.496)	(4.112)	(0.558)	(0.428)	(1.494)
Pseudo-R-squared	0.060	0.027	0.014	0.011	0.073	0.081	0.053	0.068	0.024
Observations	475	475	475	475	475	475	475	475	475

Notes: Tobit estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. Socioeconomic control variables are included in all models, but are not shown here for brevity. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A10. Associations between the use of different retailers and the consumption of selected food groups (full results, all retailers).

	Household food consumption (kg/week)								
	Cereals and tubers	Legumes	Fruits	Vegetables	Meat and fish	Dairy products	Eggs	Oils and fats	Sugar, beverages
Hypermarket	0.025	–0.009	–0.009	0.013	0.043*	0.053*	0.007	0.009	0.040***
	(0.031)	(0.019)	(0.018)	(0.020)	(0.023)	(0.029)	(0.006)	(0.005)	(0.008)
Supermarket	0.011	0.003	–0.031**	0.027	0.030*	0.055***	0.005	0.005	0.015*
	(0.018)	(0.012)	(0.015)	(0.021)	(0.016)	(0.020)	(0.003)	(0.004)	(0.008)
Convenience store	0.058**	–0.007	–0.039*	0.012	0.022	0.014	0.002	0.014**	0.020
	(0.025)	(0.011)	(0.023)	(0.019)	(0.015)	(0.050)	(0.005)	(0.006)	(0.013)
Fast-food restaurant	–0.100***				0.110*	0.132**			0.105**
	(0.037)				(0.062)	(0.055)			(0.049)
Grocery store	0.013	–0.003	–0.030*	0.016	0.026	0.063**	0.008**	0.005	0.028***
	(0.016)	(0.013)	(0.017)	(0.023)	(0.016)	(0.029)	(0.004)	(0.004)	(0.007)
Traditional market	0.011	0.016	–0.033**	0.058***	0.015	0.023	0.004	0.011***	0.024***
	(0.018)	(0.013)	(0.015)	(0.015)	(0.015)	(0.022)	(0.003)	(0.004)	(0.008)
Roadside market	0.010	0.012	–0.038**	0.038**	0.007	0.038**	0.006	0.005	0.010
	(0.019)	(0.013)	(0.018)	(0.016)	(0.016)	(0.015)	(0.004)	(0.004)	(0.007)
Neighborhood kiosk	0.030	–0.013	–0.014	–0.008	–0.010	0.057**	0.017***	0.007	0.027*
	(0.027)	(0.015)	(0.017)	(0.025)	(0.019)	(0.027)	(0.004)	(0.005)	(0.015)
Male	0.217	0.687***	–0.020	0.765	0.471*	–0.148	0.053	0.421***	0.173
	(0.478)	(0.141)	(0.308)	(0.469)	(0.249)	(0.531)	(0.085)	(0.092)	(0.193)
Age	0.025	0.007	–0.002	–0.003	–0.0003	0.015	0.003	0.009***	0.021***
	(0.021)	(0.008)	(0.011)	(0.014)	(0.007)	(0.018)	(0.004)	(0.003)	(0.006)
Household size	0.955***	0.208***	–0.034	0.342***	0.128*	0.281	–0.004	0.056**	0.139
	(0.123)	(0.073)	(0.072)	(0.088)	(0.076)	(0.208)	(0.020)	(0.028)	(0.101)
Education	0.049	0.034	0.064*	–0.045	0.121***	0.118	0.057***	–0.022*	0.086***
	(0.049)	(0.032)	(0.036)	(0.065)	(0.035)	(0.099)	(0.020)	(0.012)	(0.023)
Income (log)	0.374*	–0.098	0.016	0.032	0.462***	0.864***	0.106**	0.089*	0.195
	(0.193)	(0.127)	(0.114)	(0.197)	(0.171)	(0.263)	(0.043)	(0.047)	(0.148)
Chewa	0.953*	0.646**	0.086	–0.287	0.725**	–0.750	0.078	0.500***	0.546
	(0.537)	(0.301)	(0.389)	(0.718)	(0.292)	(0.728)	(0.109)	(0.103)	(0.332)
Tonga	0.290	0.473**	–0.409	1.040**	0.429	0.312	0.045	0.234***	–0.207
	(0.526)	(0.204)	(0.282)	(0.426)	(0.310)	(0.505)	(0.149)	(0.073)	(0.218)
Catholic	0.100	0.265	0.239	0.764	–0.297	–0.275	0.121	–0.003	0.039
	(0.424)	(0.242)	(0.304)	(0.466)	(0.340)	(0.335)	(0.094)	(0.084)	(0.167)
Seventh Day Adventist	1.025***	0.224	0.720***	0.366	–0.462	0.452	–0.078	0.129*	–0.312
	(0.384)	(0.265)	(0.219)	(0.574)	(0.434)	(0.510)	(0.119)	(0.071)	(0.211)
Constant	–0.852	–0.848	0.741	–1.149	–5.015*	–19.214***	–2.542***	–1.830***	–5.442***
	(3.222)	(1.862)	(1.744)	(2.243)	(2.774)	(5.136)	(0.711)	(0.563)	(1.490)
Pseudo-R-squared	0.065	0.045	0.044	0.028	0.086	0.101	0.074	0.085	0.034
Observations	475	475	475	475	475	475	475	475	475

Notes: Tobit estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. Socioeconomic control variables are included in all models, but are not shown here for brevity. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A11. Associations between the use of different retailers and the consumption of food groups (in value terms).

	Food expenditure (ZMW/week)							
	Cereals and tubers	Legumes	Fruits	Vegetables	Meat and fish	Dairy and eggs	Oils and fats	Sugar, beverages
Panel A:Only supermarkets considered								
Supermarket	0.095	–0.015	–0.315**	–0.258***	0.445***	–0.059	–0.017	–0.086
	(0.069)	(0.134)	(0.140)	(0.081)	(0.167)	(0.053)	(0.032)	(0.054)
Other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Multiple retailers considered								
Hypermarket	0.863**	0.025	0.248	–0.300	1.115*	0.895**	0.237***	0.109
	(0.358)	(0.422)	(0.813)	(0.267)	(0.664)	(0.366)	(0.066)	(0.133)
Supermarket	0.233	0.197	–0.866***	–0.066	1.093***	0.284*	0.159**	–0.011
	(0.177)	(0.258)	(0.330)	(0.244)	(0.381)	(0.152)	(0.069)	(0.149)
Convenience store	0.952**	0.521*	–1.084*	0.446	0.436	0.384**	0.255***	0.024
	(0.409)	(0.284)	(0.564)	(0.410)	(0.356)	(0.173)	(0.077)	(0.220)
Fast-food restaurant	0.866				4.527**	1.518		0.355
	(1.317)				(1.789)	(1.231)		(0.369)
Grocery store	0.189	–0.035	–0.740**	–0.021	0.879**	0.348*	0.140**	0.074
	(0.180)	(0.242)	(0.342)	(0.268)	(0.400)	(0.209)	(0.065)	(0.123)
Traditional market	0.008	0.546**	–0.711**	0.418**	0.722*	0.203	0.220***	0.054
	(0.141)	(0.254)	(0.294)	(0.196)	(0.379)	(0.150)	(0.062)	(0.130)
Roadside market	–0.143	0.417*	–0.878***	0.593***	0.508	0.329**	0.110*	–0.111
	(0.168)	(0.225)	(0.301)	(0.173)	(0.383)	(0.164)	(0.063)	(0.129)
Neighborhood kiosk	0.229	–0.239	–0.108	0.017	0.146	0.670***	0.219**	0.282
	(0.221)	(0.279)	(0.445)	(0.310)	(0.477)	(0.177)	(0.091)	(0.262)
Other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	475	475	475	475	475	475	475	475

Notes: Tobit estimates are shown with cluster-corrected standard errors in parentheses. All types of retailers are represented by the household expenditure share for this retailer. Socioeconomic control variables are included in all models, but are not shown here for brevity. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.