

DOI: 10.18697/ajfand.76.15430**FOOD RETAIL ASSESSMENT AND FAMILY FOOD PURCHASE BEHAVIOR
IN ASHONGMAN ESTATES, GHANA****Aryeetey R^{1*}, Oltmans S², and F Owusu³****Richmond Aryeetey**

*Corresponding Author email: raryeetey@ug.edu.gh

¹ Department of Population, Family and Reproductive Health; School of Public Health, University of Ghana, Legon, Accra, Ghana

² Iowa State University Extension and Outreach, Ames, Iowa, USA

³ Iowa State University, Ames, Iowa, USA



ABSTRACT

A key feature of the nutrition transition in developed countries is the rapid transformation of the food system towards increasing availability and access to cheaper, and more processed foods. These changes are associated with alterations in dietary behavior with implications for chronic disease risk. However, the process of change in the food system begins with changes in the food retail system and its subsequent effect on consumer behavior. Currently, little is known about the nature of the food marketplace in emerging economies like Ghana, and also how the changing economy and food retail situation are influencing consumer behavior. The current paper presents a case study of the food retail system and consumer food purchase behavior in suburban Accra. Between May and August 2012, an assessment of food retail outlets was carried out in Ashongman Estates, a suburb of Accra. The study involved observations, in-depth interviews with retailers, and a survey of households. Data from the study allowed classification of retail food vendors across the urban food retail system. In addition, data on food purchase preferences and purchase behavior were obtained from a household survey of 75 randomly selected households in Ashongman Estates. The data showed that traditional markets still constitute the most important source of household food purchases. A majority of households (87%) reported preference for traditional markets, and almost all households (99%) indicated traditional markets as their main source for purchasing household food. Foods available from supermarkets were mainly processed foods. However, processed foods are also commonly available through the traditional markets and minimarkets. The preference for traditional markets was attributed to greater variety of foods, lower price, and proximity of food source. Minimarket vendors, including corner stores, table top vendors, hawkers, and fuel station shops that are located within the community, served as an additional food source, complementing food purchases from the traditional markets. The study concluded that although traditional markets remain the main source of household food, interventions are needed to ensure that food markets in the community include access to a variety of fresh produce rather than promote processed foods, in order to promote consumer health.

Key words: Food environment, traditional market, retail, supermarket, minimarkets, suburban food market



INTRODUCTION

The food environment is conceptualized as the combination of physical, social, legal, and policy factors that influence what people choose to eat. Further, it has been identified as a key driver of the nutrition transition [1-3]. Studies in urban areas in many developed countries have shown that the food environment has been influenced by the modern built environment, making it increasingly easier to access unhealthy food options [4, 5]. This characteristic of the urban food environment has also been described as 'food desert', a term used to describe neighborhoods with limited physical and economic access to healthier food options such as fruits, vegetables and other healthy whole foods [6-8]. Food deserts, which are often located in poor neighborhoods, are created when supermarkets and other sources of fresh produce are situated, as part of zoning regulations, further away from living areas or require having private transportation to reach [9-11]. Because people are increasingly moving to live in urban areas, the relationship between the urban built environment and the food environment has become an important challenge for cities, and more so, when the food environment is linked with dietary behavior and health and nutrition outcomes [12].

It appears that the situation in developing country settings is quite different. The main food retail outlets in developing countries are traditional open markets, together with a wide variety of other smaller retail outlets including petty traders, corner stores, table top sellers, and itinerant hawkers [13-15]. Currently, limited empirical evidence exists particularly on urban food environments in sub-Saharan Africa. The Food and Agricultural Organization has reported that urban food markets in Africa are largely unsophisticated and lack an efficient marketing system needed to maintain food quality and keep retail prices reasonably low [16]. Also, current evidence shows a rapid increase in supermarket stores in the food retail sector in sub-Saharan Africa, especially in Southern and Eastern Africa [17-19]. This situation exists in an environment where there is both rapid urbanization, increasing globalization of food trade, and exposure of consumers to new and processed products [20]. Also, there is a contemporary and persistently increasing high demand for cheaper, easily accessible food [21].

Ghana is among a few sub-Saharan African countries which are experiencing steady economic growth and relative political stability [22]. Recent expansion of the economy has led the World Bank to re-categorize the country from a low income to a lower middle income status [23]. These changes in the Ghanaian economy are engendering changes in consumer behavior, which has resulted in the proliferation of many modern food retail outlets and supermarkets across the country [24]. Little is known, however, about the general retail and distribution of food in Ghana and more importantly, how the food retail system is influencing consumer choices and behavior. Also unknown is the effect of other important social transitions such as rapid urbanization, and economic expansion, influencing simultaneously, the food purchase behavior of urban residents [25]. This study attempts to fill these gaps in the literature.

A longitudinal research design will be ideal for studying the effect of these transitions on consumer food purchasing behavior and its linkages with dietary and health outcomes. In the absence of such data, a case study was conducted to explore the characteristics of



food retail in Ashongman Estates, a peri-urban community in Accra, Ghana, with the view to understand how food purchase behaviors are influenced by the local food system. In particular, the study describes the existing food retail outlets within and outside Ashongman Estates, and accessibility to these food retail points. It also explores urban consumer food purchase preferences. The significance of the findings is discussed in the context of formulating public policies and programs to make the food system health-promoting.

METHODS

Study area and context

Data collection for this case-study was carried out between May and August 2012 in Ashongman Estates. This urban community is located approximately 25 Kilometers (driving distance), north of central Accra. Accra is the administrative and economic capital of Ghana (Figure 1) and also the capital city of the Greater Accra Region. The Greater Accra Region is among the fastest growing urban areas in West Africa, with an annual growth rate exceeding 3% [25]. An estimated 61% of the urban population live in slums and squatter settlements [25]. The Ashongman Estates is a relatively well-planned community, with grid pattern housing layout. Similar to other peri-urban communities in Ghana, the Ashongman Estates remains in a state of on-going housing and infrastructural development, made up of both completed homes as well as houses at various stages of development.

Data collection methods

The study identified all food retail points in Ashongman Estates as well as others located in close proximity and accessible to Ashongman Estates residents. Direct observation, using a checklist, was used to describe and classify the food retail ecology of Ashongman Estates. A survey questionnaire, with both open- and closed-ended questions, was used to interview food retailers on types of food sold, the size and locations of the business, where merchandise were obtained, and the demographic characteristics of respondents. Due to the large number of vendors, a conveniently selected sample of vendors (n=19) participated in the interviews. Participants represented different classes of food sellers, with respect to their locations, types of food sold, and variety of foods on display.

Following the survey of the vendors, a consumer purchasing behavior survey of 75 households was also conducted. With the aid of a Google Maps satellite image of the community (<https://www.google.com.gh/maps>), all houses were listed and assigned to one of the three clusters generated based on number and density of houses. Twenty-five households were then selected using systematic random sampling from each of the clusters using the RANDBETWEEN function in MS Excel (Microsoft, USA). In each selected house, the person who typically purchases food for the household was invited to respond to the survey. The survey collected data on household demographic characteristics, access to food retail points in Ashongman Estates and surrounding areas, types of foods purchased, and household food purchase patterns. A list of 58 local commonly consumed food items was used to solicit information on food purchase behavior. All interviews were administered face-to-face in English, Twi and Ga languages, with the help of a multilingual field assistant. Additionally, geographic



coordinates of retail points in the community as well as the major markets from which Ashongman Estates residents purchased food frequently were recorded using a handheld Geographic Positioning system (GPS) unit (eTrex, Garmin, USA). The GPS enabled digital camera enabled the collection of images linked with the geographic coordinates.

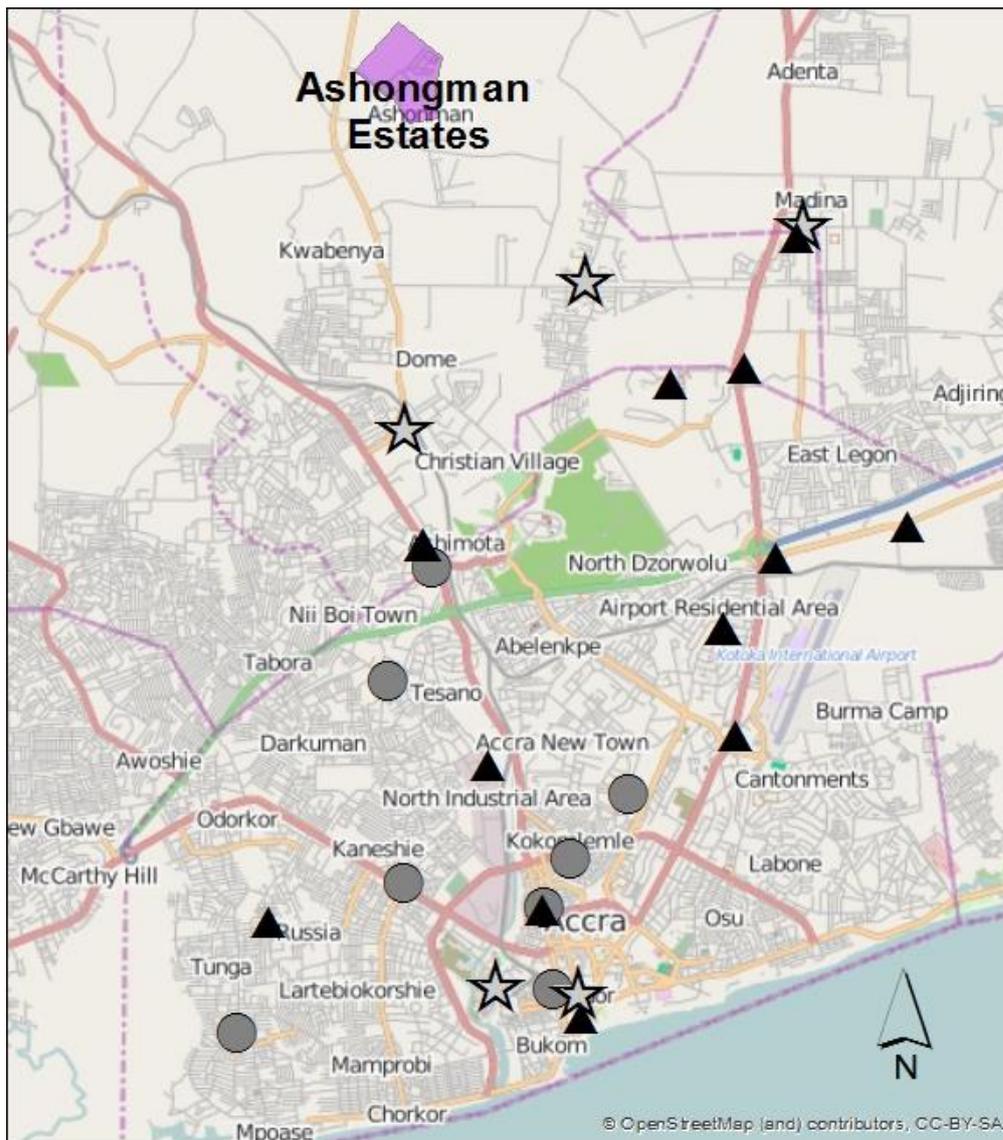
Data and analysis

All data were entered and coded using EpiData version 3.1. Data analysis was performed using SPSS version 16.0 (SPSS Inc, Released 2007, Chicago, USA). Frequencies, and bar and pie charts were used to summarize and describe household behavioral data. Bivariate associations between food source and household socio-demographic characteristics were assessed using Pearson Chi Square. Fisher's Exact Test was used where sample sizes were less than allowed for the Pearson Chi Square test. Significance was assessed at $p < 0.05$. Interviews were transcribed using the iZotope RX 2 software. Maps were created using Quantum GIS version 1.8, Google Earth and Arc GIS version 10.1.

FINDINGS

Food vending in and around Ashongman Estates

Three broad categories of food vendors were identified in the community namely, traditional markets, supermarkets, and mini-markets (Table 1). Traditional markets are identifiable locations where various goods, the bulk of which is food commodities, are offered for sale. Overall, 15 traditional markets were identified within a 25-kilometer radius of Ashongman Estates (Figure 1). Typically, traditional market vendors are small-scale retail entrepreneurs (84% of 19 food vendors interviewed) ranging from table-top scale to those owning a larger stall. A minority of wholesale food vendors displaying a relatively larger scale of products; wholesalers were also found operating from traditional market locations. Traditional markets are situated on government-owned land, managed by the relevant city authority. With the exception of three traditional markets which were constructed with concrete and adequately roofed, traditional markets in Accra were, typically, open-air spaces where vendors displayed their wares in the open or under temporary sheds with metal sheet roofing. Comparing by floor size, these included six large, six medium, and three small markets. The largest of these is *Makola* market. The Dome market was closest in proximity to Ashongman Estates and is located about 10 Kilometers away. In all the traditional markets observed, the food section was the largest in terms of floor space and number of retailers. Traditional markets offered a wide variety of food products; ranging from fresh foods with short shelf-life to various types of processed foods such as canned vegetables, dairy products, meat and fish. Although the traditional markets were accessible daily, each market site has a known 'market day' on which fresh produce was more abundant, and sold at relatively lower prices.



Legend

- ☆ Popular Traditional Markets
 - Other Traditional Markets
 - ▲ Supermarkets
- 0 2.5 5 Miles

Figure 1: Supermarkets and traditional markets located within 25 Kilometers radius of Ashongman Estates, Ghana

Supermarkets included in the study were identified as retail outlets operated as a limited liability company and recognized by a unique trademark. Unlike traditional markets which have multiple traders in one location, supermarkets were owned or operated by a single entity (company or individual) and offered a wide variety of products in one location. The study identified 13 supermarkets within 25-kilometer radius of Ashongman Estates (Figure 1). Of these, only five offered fresh produce. Processed foods (imported

and locally produced) constituted the largest share of the items in the food sections in supermarkets, followed by frozen foods (for example frozen fish, meat, poultry, pork, and others), and grains. The volume of the fresh fruits and vegetables section in supermarkets were relatively small and was, often, only as large as or slightly larger than the spices section. In supermarkets where fresh produce was available, imported produce were more likely to be found on the shelf than local/indigenous foods.

The third category, minimarkets, comprised a range of small-scale retailers, including corner stores, table-top vendors, itinerant hawkers, gas station mini-shops, bakeries, and frozen food retailers scattered throughout the Ashongman Estates community. A total of 102 minimarkets (excluding hawkers and ready-to-eat food vendors) were identified in Ashongman Estates. Per retailer, minimarkets typically offer a smaller variety of food items than traditional markets and supermarkets. However, their ubiquitous distribution throughout the community and closer proximity to homes provides residents with access to a wide range of food items.

Consumer purchase behavior

The socio-economic characteristics of the 75 households included in the household survey are described in Table 2 below. The median household size is five and not surprising, females were the main respondents since they traditionally are responsible for household food purchases and preparation in Ghana. About half of respondents had completed secondary education. As common with newly developing suburban communities around Accra, most of the households interviewed had a backyard garden where basic food crops such as maize, pepper, tomatoes, and cassava were cultivated. Almost all households interviewed identified traditional markets as the most common source for purchasing household foods (Figure 2). Supermarket and minimarket food shopping were also reported but less frequently than traditional markets.

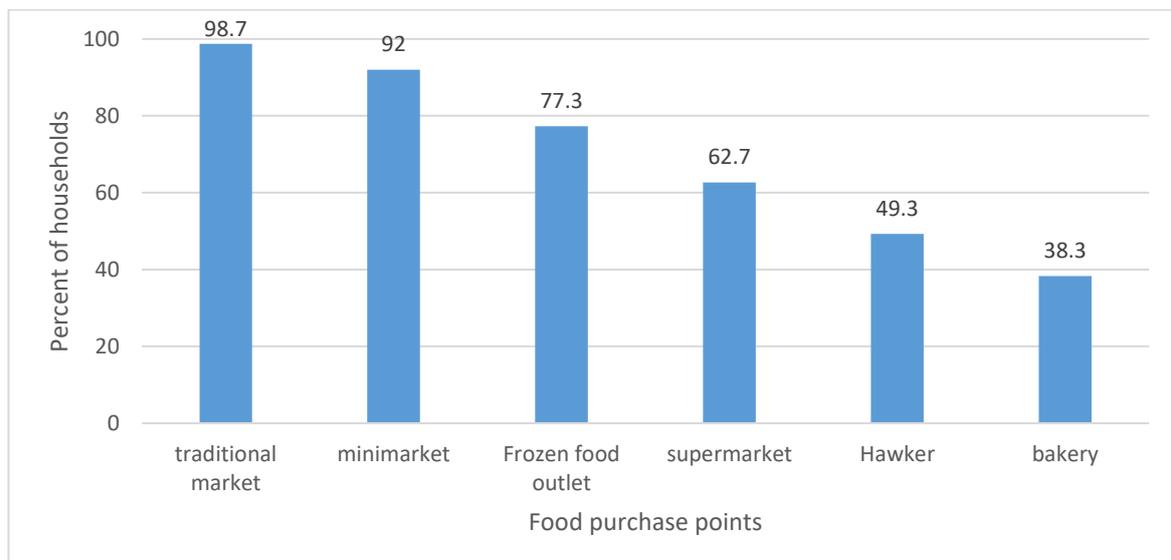


Figure 2: Places where Ashongman Estates residents purchased household food items

Note: Respondents were given list of food retail outlets and were asked to indicate whether or not they purchased food items from any of the outlets

Among the traditional markets located within 25-kilometer radius of the Ashongman Estates, respondents reported frequently utilizing three of them that were closest in proximity (Dome, Madina, and Haatso markets). In addition, Makola and Agboglobshie markets were frequently utilized even though these are relatively further away. Weekly purchase of food from traditional markets was reported by more than two thirds of respondents (71%). Supermarkets were the least frequently reported point of food purchase; a majority of respondents (65%) reported purchasing food from supermarkets once or twice in a month.

A majority of households indicated that their preferred place to purchase food was the traditional market (Table 3). The most commonly indicated reasons for preference of a place of food purchase were availability of variety of foods (71%), lower food prices (65%), and convenient access to the purchase point (61%). Most households reported that they accessed the food purchase point using public transportation.

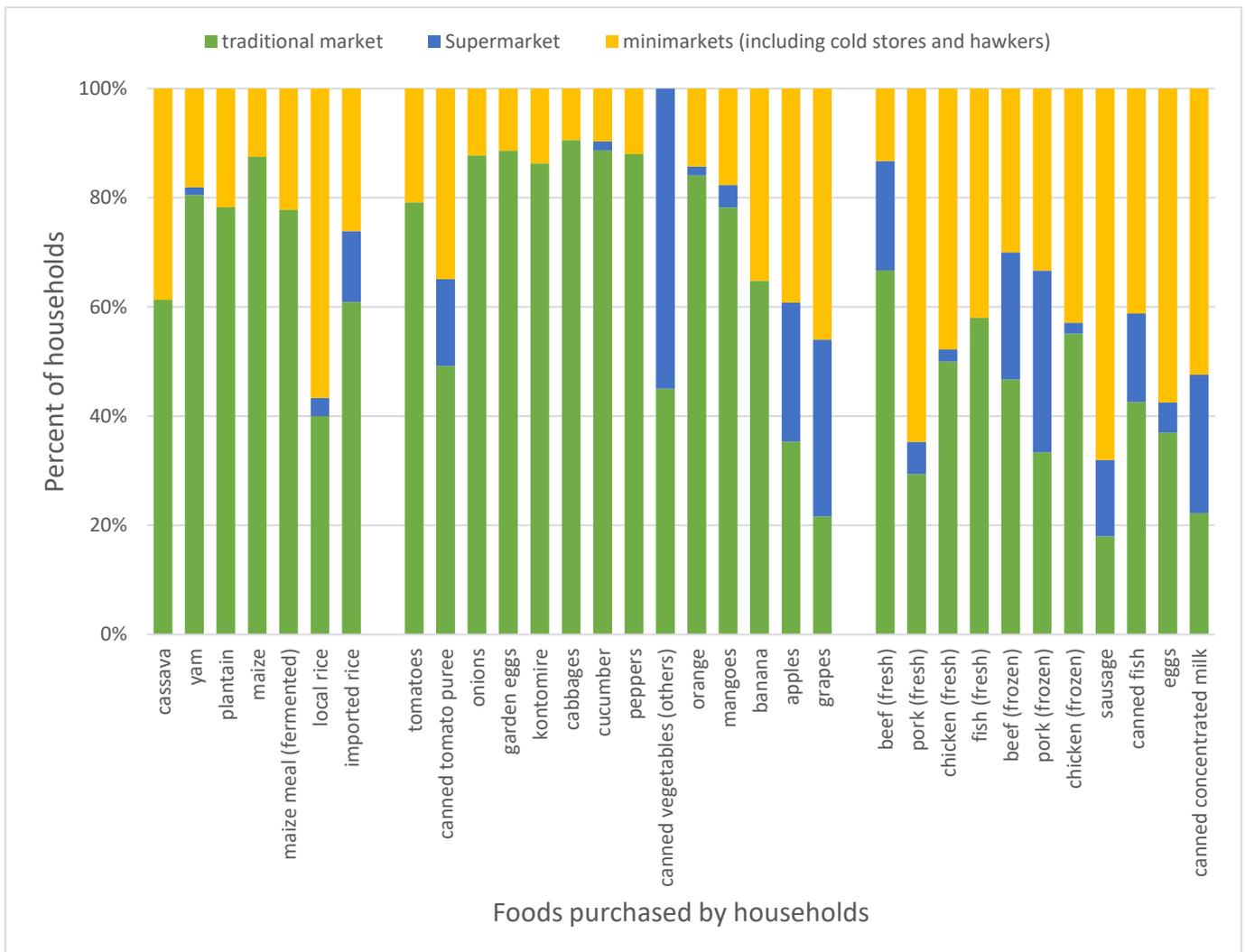


Figure 3: Points of food purchase by Ashongman Estates households

Table 4 shows the characteristics of consumers who purchased food from various retail points.

Dome market (one of the closest in proximity) stands out as the main point of food purchase for most households (at least 88%). Among minimarket categories, corner stores and frozen food stores were also commonly utilized by Ashongman Estates residents. Education level of respondent and household ownership of a vehicle were significant predictors of location of food purchase. Families without a vehicle were significantly less likely to purchase food from either a supermarket or Haatso market ($P < 0.05$). Also, less educated respondents reported less likelihood of food purchase from supermarkets ($p < 0.05$).

Households purchased fresh and unprocessed foods as frequently as they did for processed foods (Figure 3). The traditional market is the usual source of unprocessed foods with longer shelf-life including staples such as grains and tubers. Also, perishable foods such as fresh fruits and vegetables were more frequently purchased from traditional markets. On the other hand, processed and frozen foods were purchased as frequently from supermarkets and minimarkets as from the traditional markets.

DISCUSSION

The objective of this study was to shed more light on the food environment and its influence on food purchase behavior among urban households in Accra, Ghana. Based on earlier evidence of the nutrition transition that urban households typically transition towards accessing processed and energy-dense foods [26-29], it was expected that residents in this mostly middle class neighborhood of Accra would demonstrate a high preference for food purchases from supermarkets. The main finding of this study, however, is that residents in Ashongman Estates are strategic – they frequently purchase household food from traditional food markets that are closer to their residence than from any other source. This behavior is consistent with their expressed preference for purchasing food from traditional markets. Respondents described traditional markets as offering a wider variety of foods and also at cheaper prices [30], thus, it can be argued that price and commodity diversity are major driving factors for urban households when deciding where to purchase food. In addition, shopping from traditional markets gives consumers opportunity to experience one-stop shopping for the wide range of indigenous foods as well as non-food household goods offered by these markets. Such convenience offered by the traditional markets is also critical for urban shoppers who need to avoid the rather busy vehicular traffic in Accra [31]. The need for convenience may also explain the frequent purchase of food from minimarkets, although minimarket commodities are typically more expensive [32].

The relatively smaller percentage of households in Ashongman Estates that reported purchasing their household food from supermarkets is consistent with a recently published survey of consumers in three cities in Ghana (Accra, Tamale, and Tarkoradi) where only about 18% of households reported shopping for food from supermarkets at least once a week. The finding suggests a continued dominance of the food retail sector by traditional markets in Ghana, a situation which has also been reported elsewhere in

the West Africa sub-region [16, 30]. In Eastern and Southern African countries where the market share of supermarkets is larger, the competition is often unfavorable for the existing local traditional markets/stores [18], leading to the decline of traditional small scale retail outlets.

Studies in urban settings of developed countries have reported linkages between food retail and changes in dietary patterns [9, 10, 26]. Typically, changes in food retail results in increased consumption of energy-dense foods, resulting from greater physical and financial access to highly processed foods. Therefore, on one hand, the persistence of the traditional market can potentially limit exposure to energy-dense foods while promoting access to fresh produce. On the other hand, traditional markets were also a source of processed foods as reported in other studies [33]. Thus, households which patronize traditional markets have access to healthy food options along with the less healthy processed foods. The implication is that they become exposed to unhealthy options from a source that is traditionally considered a healthier source of food. Further studies are needed to understand the profile of foods purchased from traditional markets and the contribution of processed foods to the total purchase. It is, however, clear that supermarketization of the food system in Ghana, even among the emerging middle class in Ghana, has not yet occurred [17]. Thus, there may still be a window of opportunity for policy makers in Ghana and similar countries to develop strategies to reduce some of the negative dietary effects associated with of the spread supermarkets.

The findings in this case study should, however, be interpreted in the context of the following limitations. Firstly, the household survey involved a small number of households and thus not considered representative of Accra residents or even Ashongman Estates. The small sample size of the household survey also precluded detailed analysis of relationships between variables. Secondly, the study did not map out all possible food retail outlets used by Ashongman Estates residents, as it was not designed for such purpose. For instance, as common with many Accra residents, many households tend to buy foodstuffs from outside Accra when they travel to the countryside. As a result, Ashongman Estates residents may have other sources of food that is not indicated here. Thus, further studies with a larger sample is needed that should be designed to enable more comprehensive assessment of the food system.

CONCLUSION

This exploratory study found that traditional markets located in various parts of the city remain the most common source of household food. The continued use of traditional markets should provide policy makers in Ghana with a window of opportunity to explore strategies for promoting healthy food purchase behavior. Based on the history of the spread of supermarkets in Africa [13, 17, 19], it seems the spread of supermarkets in Ghana is inevitable in the long run. Thus, interventions to strengthen the capacity of the traditional markets to sustain the supply of fresh and other health-promoting foods to urban consumers in Accra and make them competitive will be an important first step. Policy makers can also ensure that the potential effects of the proliferation of supermarkets in terms of unhealthy food purchases are minimized. In addition, consumer education can help influence consumer choices and ensure the provision of wide varieties



of fresh food in the supermarkets. The findings of this exploratory study should, however, be interpreted with caution, given the small sample of households in the survey. Future studies would be needed to clarify whether and how the other dimensions of the food system, such as affordability of fresh and healthy food affect food purchases. Case studies of how city authorities can help facilitate the promotion of healthy food retail systems in rapidly changing urban communities will be useful to policy makers in Ghana and other African countries as they attempt to reverse predicted negative outcomes of the nutrition transition in the community. Finally, considering the rapid transitions in food systems in developing countries, increased research funding is needed to carry out studies like this in urban and peri-urban communities; particularly in sub-Saharan Africa, as part of the continent-wide response to nutrition transition.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHORS' CONTRIBUTIONS

Richmond Aryeetey co-conceived the study with Francis Owusu, participated in study design, study tools preparation, data analysis and preparation of manuscript. Shelley Oltmans led study tool development and data collection, participated in data analysis, and critically revised the manuscript. Francis Owusu co-supervised the study, participated in study design, finalizing study tools, and critically revising the manuscript. All authors read and approved the final manuscript.

AUTHORS' INFORMATION

Richmond Aryeetey (MPH, PhD) is a Senior Lecturer in the Department of Population, Family, and Reproductive Health at the School of Public Health of the University of Ghana. Shelley Oltmans (MS) is a Community Development Specialist and Director of Keokuk Chamber of Commerce in Iowa, USA; and Francis Owusu (PhD) is Professor of Community and Regional Planning at the Department of Community and Regional Planning Department at Iowa State University, Iowa, USA.

ACKNOWLEDGEMENTS

Authors would like to acknowledge the vendors and households in Ashongman Estates and elsewhere in Accra Ghana who participated in the interviews and also allowed access to their businesses and homes. The study was supported with funding from the Butler Travel Award for International Study in Sustainable Livelihoods, Iowa State University.



Table 1: Category of foods offered for sale by food vendors within 25 Kilometers miles of Ashongman Estates, Ghana

Mini-Markets	Traditional Markets	Supermarkets
Fresh produce	Fresh produce	Frozen foods
Preserved foods	Preserved foods	Bakery products
Processed foods	Processed foods	Processed foods
Tubers	Tubers	Frozen and refrigerated
Grains	Grains	foods
Frozen and refrigerated	Frozen foods	Fresh produce
foods	Fresh meat and seafood	Grains
Oils/fats	Live animals	Oils/fats
Dairy products	Oils/fats	Dairy products
Bakeries		

Table 2: Characteristics of households and study participants in the Ashongman Estates, Accra (N=75)

	Number of households	% of households
Household size		
≤3	16	21.3
4-6	39	52.0
7+	20	26.7
Type of household		
Nuclear family	57	76
Extended family	18	24
Living situation		
Home owner	43	57.4
Rented home	22	29.3
Squatter	10	13.3
Ownership of a private vehicle		
Yes	47	62.7
No	28	37.3
Household Meal frequency/week		
Daily breakfast	53	70.7
Daily dinner	69	92.0
Respondent education		
None/primary	10	13.3
Junior high/Senior high	25	33.3
Post- senior high/tertiary	40	53.4
Employment status		
Unemployed	26	34.7
Formal*	17	22.7
Self employed	32	42.6
Household food production		
Yes	45	60.0
No	30	40.0

* formal employment includes teacher, pharmacists, administrator, banker; informal employment includes store attendant, dress maker, trader

Table 3: Preferred outlets for household food purchases and reasons for preference by Ashongman Estates residents, Ghana

Characteristic	Frequency	Percentage
Preferred food purchase outlet		
Traditional market	65	86.7
Minimarket	4	5.3
Supermarket	6	8.0
Reason for preferred food retail outlet		
Variety of foods	53	70.7
Low prices	49	65.3
Convenient access	46	61.3
Proximity	30	40.0
Specialty foods available	25	33.3
Familiar with retailer	7	9.3
Hygienic environment	4	5.3
Usually able to purchase most household food from preferred outlet	49	65.3
Transportation to preferred outlet		
Walking	3	4
Commercial transportation	51	68
Family vehicle	21	28

Table 4: Association between food sources and socio-demographic characteristics of Ashongman Estates respondents, Accra

Respondent characteristics	Food source categories									
	Traditional markets					Supermarket (N=46)	Minimarkets			
	Dome (N=69)	Madina (N=69)	Makola (N=34)	Agbogbloshie (N=23)	Haatso (N=29)		Corner stores (N=69)	Roadside vendor (N=39)	frozen food store (N=57)	Hawker (N=9)
Household size										
≤3	87.5	37.5	50.0	20.0	56.2	73.3	100	53.3	80.0	68.8
4-6	94.9	53.8	41	37.8	33.3	61.5	89.7	53.8	76.9	41.0
7+	90.0	60.0	50.0	30.0	40.0	55.0	90.0	50.0	75.0	50.0
Type of household										
Nuclear family	91.2	50.9	40.4	27.4	43.6	66.1	94.7	46.4	76.8	54.4
Extended family	94.4	55.6	61.1	44.4	29.4	50	83.3	72.2	77.8	66.7
Vehicle ownership										
Does not own vehicle	92.9	53.6	50.0	28.6	25.0 [¥]	32.1 [¥]	96.4	53.6	82.1	35.7
Owens vehicle	91.5	51.1	42.6	34.1	50.0	80.4	89.4	52.2	73.9	57.4
Home Ownership										
Rented home	90.9	50.0	50.0	23.8	40.9	63.6	95.5	47.6	90.5	59.1
Home owner	93.0	53.5	48.8	41.5	47.5	66.7	90.7	60.5	67.4	48.8
Squatter	90.0	50.	20.0	10.0	10.0	40.0	90.0	30.0	90.0	30.0
Employment status										
Unemployed	96.2	46.2	34.6	20.0	41.7	60.0	92.3	57.7	73.1	46.2
Unemployed	89.8	55.1	51.0	38.3	39.6	63.3	91.8	50.0	79.2	51.0
Educational level										
Less than high school	95.0	55.0	55.0	35.0	30.0	25.0 [¥]	95.0	45.0	85.0	30.0 [¥]
High school or higher	90.9	50.9	41.8	30.8	44.2	75.9	90.9	55.6	74.1	56.4

The highlighted cells shows significant differences in proportion at $p < 0.05$, assessed with Pearson chi-square

REFERENCES

1. **Khan LK, Sobush K, Keener D, Goodman K, Lowry A, Kakietek J and S Zaro** Recommended community strategies and measurements to prevent obesity in the United States. *MMWR Recommendations and reports : Morbidity and mortality weekly report Recommendations and reports / Centers for Disease Control* 2009; **58**(Rr-7):1-26.
2. **Booth SL, Sallis JF, Ritenbaugh C, Hill JO, Birch LL, Frank LD, Glanz K, Himmelgreen DA, Mudd M, Popkin BM, Rickard KA, St Jeor S and NP Hays** Environmental and societal factors affect food choice and physical activity: rationale, influences, and leverage points. *Nutr Rev* 2001; **59**(3 Pt 2):S21-39; discussion S57-65.
3. **Ahern M, Brown C and S Dukas** A national study of the association between food environments and county-level health outcomes. *The Journal of Rural Health : official journal of the American Rural Health Association and the National Rural Health Care Association* 2011; **27**(4):367-379.
4. **Mercille G, Richard L, Gauvin L, Kestens Y, Shatenstein B, Daniel M and H Payette** Associations between residential food environment and dietary patterns in urban-dwelling older adults: results from the VoisiNuAge study. *Public Health Nutr* 2012; **15**(11):2026-2039.
5. **Richardson AS, Boone-Heinonen J, Popkin BM and P Gordon-Larsen** Are neighbourhood food resources distributed inequitably by income and race in the USA? Epidemiological findings across the urban spectrum. *BMJ Open* 2012; **2**(2):e000698.
6. **Dubowitz T, Zenk SN, Ghosh-Dastidar B, Cohen DA, Beckman R, Hunter G, Steiner ED and RL Collins** Healthy food access for urban food desert residents: examination of the food environment, food purchasing practices, diet and BMI. *Public Health Nutr* 2015; **18**(12):2220-2230.
7. **Gordon C, Purciel-Hill M, Ghai NR, Kaufman L, Graham R and G Van Wye** Measuring food deserts in New York City's low-income neighborhoods. *Health & Place* 2011; **17**(2):696-700.
8. **Matson J** High and dry in the food desert. *Scientific American* 2012; **306**(5):96.
9. **Zenk SN, Lachance LL, Schulz AJ, Mentz G, Kannan S and W Ridella** Neighborhood retail food environment and fruit and vegetable intake in a multiethnic urban population. *American journal of health promotion : AJHP* 2009; **23**(4):255-264.

10. **Zenk SN, Schulz AJ, Lachance LL, Mentz G, Kannan S, Ridella W and S Galea** Multilevel correlates of satisfaction with neighborhood availability of fresh fruits and vegetables. *Annals of Behavioral Medicine : a publication of the Society of Behavioral Medicine* 2009; **38(1)**:48-59.
11. **Walker RE, Keane CR and JG Burke** Disparities and access to healthy food in the United States: A review of food deserts literature. *Health & Place* 2010; **16(5)**:876-884.
12. **Dixon J, Omwega AM, Friel S, Burns C, Donati K and R Carlisle** The health equity dimensions of urban food systems. *Journal of Urban Health : bulletin of the New York Academy of Medicine* 2007; **84(3 Suppl)**:i118-129.
13. **Weatherspoon DD and T Reardon** The rise of supermarkets in Africa: Implications for agrifood systems and the rural poor. *Development Policy Review* 2003; **21(3)**:333-355.
14. **Maxwell D** The political economy of urban food security in Sub-Saharan Africa. **In.**: International Food Policy Research Institute; 1998.
15. **Asiedu AB and S Agyei-Mensah** Traders on the run: Activities of street vendors in the Accra Metropolitan Area, Ghana. *Norwegian Journal of Geography* 2008; **62**:191-202.
16. **Tollens E** Food Into Cities: Collection Wholesale Markets In African Cities-Diagnosis, Role, Advantages, And Elements For Further Study And Development. **In.** Louvain, Belgium: FAO; 1997.
17. **Reardon T, Timmer CP, Barrett CB and J Berdegue** The rise of supermarkets in Africa, Asia, and Latin America. *American Journal of Agricultural Economics* 2003; **85(5)**:1140-1146.
18. **D'Haese M and GV Huylenbroeck** The rise of supermarkets and changing expenditure patterns of poor rural households case study in the Transkei area, South Africa. *Food Policy* 2005; **30(1)**:97-113.
19. **Minten B** The Food Retail Revolution in Poor Countries: Is It Coming or Is It Over? *Economic Development and Cultural Change* 2008; **56(4)**:767-789.
20. **Lake A and T Townshend** Obesogenic environments: exploring the built and food environments. *The Journal of the Royal Society for the Promotion of Health* 2006; **126(6)**:262-2013267.
21. **Igumbor EU, Sanders D, Puoane TR, Tsolekile L, Schwarz C, Purdy C, Swart R, Durao S and C Hawkes** "Big food," the consumer food environment, health, and the policy response in South Africa. *PLoS Medicine* 2012; **9(7)**:e1001253.

22. **National Development Planning Commission (NDPC)** Ghana Millenium Development Goals 2015 Report; 2012.
23. **Jerven M and ME Duncan** Revising GDP estimates in Sub-Saharan Africa: Lessons from Ghana. *African Statistical Journal* 2012; **15**:13-22.
24. **Sedro A** Shopping mall trend continues to grow in Ghana [<http://www.howwemadeitinafrica.com/trend-towards-shopping-malls-continues-to-grow-in-ghana/30129/>]; 2013. Accessed 15/01/16.
25. **United Nations Human Settlements Program (UN-HABITAT)** Ghana Housing Profile. UN Habitat, Nairobi; 2011.
26. **Banwell C, Dixon J, Seubsman SA, Pangsap S, Kelly M and A Sleigh** Evolving food retail environments in Thailand and implications for the health and nutrition transition. *Public Health Nutr* 2013;**16(4)**:608-615.
27. **Vorster HH, Venter CS, Wissing MP and BM Margetts** The nutrition and health transition in the North West Province of South Africa: a review of the THUSA (Transition and Health during Urbanisation of South Africans) study. *Public Health Nutrition* 2005;**8(05)**:480-490.
28. **Vorster HH, Wissing MP, Venter CS, Kruger HS, Malan NT, De Ridder JH, Veldman FJ, Steyn HS, Margetts BM and U MacIntyre** The impact of urbanization on physical, physiological and mental health of Africans in the North West Province of South Africa: The THUSA study. *S Afr J Sci* 2000;**96**:505-514.
29. **Ag Bendeck M, Gerbouin-Rerolle P, Chauliac M and D Malvy** An approach to food consumption in an urban environment. The case of west Africa. *Sante (Montrouge, France)* 1996;**6(3)**:173-179.
30. **Meng T, Florkowski W, Sarpong DB, Chinnan MS and AVA Resurreccion** Consumer's Food Shopping Choice in Ghana: Supermarket or Traditional Outlets? *International Food and Agribusiness Management Review* 2014;**17**(Special Issue A):107-129.
31. **Agyemang E** The bus rapid transit system in the Greater Accra Metropolitan Area, Ghana: Looking back to look forward. *Norwegian Journal of Geography* 2015;**69(1)**:28-37.
32. **Sunanto S** Modern Retail Impact on Store Preference and Traditional Retailers in West Java. *Asian J Bus Res* 2012;**2(2)**:1-19.
33. **Boselie D, Henson S and D Weatherspoon** Supermarket procurement practices in developing countries: redefining the roles of public and private sectors. *American Journal of Agriculture Economics* 2003;**85(5)**:1155-1161.