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Consumer's Food Shopping Choice in Ghana: Supermarket or Traditional Outlets?

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Abstract

Diet-related chronic health conditions such as obesity, diabetes, and heart disease have attracted a lot of attention. Food retail outlets play a significant role in affecting consumers' diet-related health and nutrition by the foods they sell and prices they charge. This study assessed the relative importance of different food retail outlets, identified the socio-demographic profiles of consumers associated with shopping in each retail format, and then illustrated how the food retail outlet choices might affect consumers' diet and nutrition, using the surveyed data set collected in 2011 from three big cities in Ghana (Accra, Tamale, and Takoradi).

Keywords: open-air market, hawkers, ordered logit model, socio-demographic factors

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Introduction

A tremendous dietary change and nutrition transition is occurring in developing countries. For the most part, this change is due to the substantial economic growth and rapid disposable income increase during the last decades. Consumers have become more concerned about the diversity, nutrition, and quality of food products they eat. Between 1963 and 2003, there was a decline in root and tuber consumption in developing countries, but a large increase in calorie-dense food products including meat (119%), sugar (127%), and vegetable oils (199%) (Kearney 2010). In the Eastern Asia/Pacific Rim region, including China and Thailand, pesticide free is considered as key food attribute (Moser et al. 2011). Similarly, demand for organic food products has increased, in addition to demand for quality assurance measures such as product labeling and traceability (Mashinini 2006). Now consumers are able to exercise these preferences due to increasing access to the expanded retail sector.

In addition to this large shift in food preferences, the food supply system in these developing countries, especially food retail formats, is also undergoing a dramatic change. Driven by the new food demand and liberalization of retail foreign direct investment (FDI), the "supermarket revolution" wave began in developing countries in the early 1990s and then spread to Latin America, followed by East/Southeast Asia and East/South Africa, then finally West Africa (Reardon et al. 2003; Reardon et al. 2004; Reardon and Hopkins 2006). In China, many international retailers, such as Walmart, are present and expanding quickly (McLoughlin et al. 2012) and their share amounts to 5-20% of national food retail sales (Hawkes 2008).

Numerous previous studies comprehensively explored the effect of supermarkets. The reports include the competition between supermarkets and existing actors in the food system (Reardon et al. 2009; Neven et al. 2006), the challenges faced by small farms and small processing/distribution firms (Louw et al. 2007 and 2008), as well as the macro impacts on domestic market development, local employment, and economic growth (Shepherd 2005; Emongor and Kirsten 2009). However, as the final link in the food supply chain, the consumer's role has often been neglected or underestimated. Among the previous studies, very few investigate supermarket expansion in developing countries and how it relates to the consumer food outlet choice. Consumers' selective adoption of supermarkets was first identified by Goldman (2000), who noted "consumers who regularly shop in supermarkets continue to purchase fresh food in traditional outlets". Okello et al. (2011) used interview information to access consumer choice of retail outlets when purchasing fresh vegetables in Kenya. Gorton et al. (2011) applied a consumer-centered model to investigate the extent to which supermarkets can capture food retailing in Thailand. Unfortunately, many developing countries do not have resources to conduct consumer surveys about food consumption and diet (Kearney 2010). Our study expands this literature by explicitly considering consumer decisions. We examine consumer food retail format choice of both modern and traditional food outlets in terms of consumer's socio-demographic characteristics in West Africa.

Growing incomes, expanding retail outlets, and changing consumer preferences in developing countries call for an examination of determinants of consumer retail food outlet choice. This

study investigates consumers' food retail shopping choices and explores how the choices could affect their diet, nutrition, and health. The present study contributes to the empirical literature addressing consumer outlet choice, and specifically fills the gap in such studies in sub-Saharan Africa by analyzing consumer choice of retail outlets for food purchasing, using the survey data collected from Ghana's urban households in 2011. The objectives of the study are to: a) explore the food retail system structure in urban Ghana; b) identify what factors, including socio-demographic characteristics, affect consumer food shopping frequency in supermarkets and traditional outlets, i.e., open-air markets and hawkers; c) illustrate the potential association between food retail outlet choice and consumer diets.

In recent decades, diet-related chronic health conditions such as obesity, diabetes, and heart disease have attracted a lot of attention. Dietary patterns can be influenced by the availability and accessibility of different types of foods (Farley et al. 2009). The increased consumption of energy-dense foods rather than foods such as fresh vegetables and fruits may be the reason for an increased prevalence of poor nutrition, obesity, and chronic diseases (Donkin et al. 2000).

The retail food outlets including supermarkets, hawkers, and open-air markets connect consumers to their food choices. These food retail outlets play a significant role in affecting consumers' diet-related health and nutrition, by the foods they sell and prices they charge. Both the promotional strategies used by some retail outlet types, and the implemented nutrition-related activities (Hawkes 2008; Tessier et al. 2010) may lead to disparities in diet and health (Moore and Diez Roux 2006). However, there is a lack of consensus on which food retail format is the best for promoting optimal nutrition for consumers. For example, in Chile, the traditional markets still compete strongly in the fruit and vegetable sector (Faiguenbaum et al. 2002). This ability to compete is a result of consumer perceptions that traditional markets offer both good prices and freshness (Goldman et al. 2002). In several large Chinese cities, about 49% of consumers reported buying the bulk of their fresh vegetables from supermarkets (Hu et al. 2004). For those participants in the US food stamp program, supermarket access was a positive predictor of fruit consumption (Rose and Richards 2004). Some studies find that limited access to supermarkets may result in poor nutrition by reducing consumption of healthy fresh foods (Morland et al. 2006; Tessier et al. 2008; Farley et al. 2009).

Additionally, supermarkets play a crucial role in introducing new processed foods or nutritious products, such as exotic out-of-season fruits or conveniently packaged vegetable snacks (Hawkes 2008). However, there are also some critics of different food outlets (i.e., supermarket, open-air market, and hawkers). For instance, supermarket expansion may be related to modern health problems such as obesity (Michimi and Wimberly 2010). Also, it has been shown that low food quality is often closely related to food products offered by hawkers (Mensah et al. 2002; Hanashiro et al. 2005; Toh and Birchenough 2000; Rane 2011). Similarly, practicing appropriate sanitation guidelines and periodic bacteriological control is necessary in open-air markets to reduce food contamination (Angelidis and Koutsoumanis 2006; Filiousis et al. 2009).

Results of an econometric model using the ordered logit regression indicate that supermarkets are accepted by urban households, especially those with high incomes or the higher education. Such households are more likely to have been exposed to exotic or out-of-season vegetables and fruits, processed food products, and new, highly nutritious food products. However, consistent

with a previous study (Field et al. 2010), the traditional retail food outlets continue to be a significant part of the agri-food system in Ghana. Results of the current study suggest that open-air markets still dominate the food retail system in Ghana, and are preferred by non-college educated households. Open-air markets especially provide large households with locally produced foods including fresh meat, vegetables, and fruits. The significant role of hawkers (the oldest food retail format) has been confirmed in Ghana's food retail system. They are favored by the low-income and less-educated households with small children, competing in terms of convenience. Thus, individuals frequently buying from hawkers are more likely to consume ready-to-eat foods, convenience foods, or beverages.

For decades, researchers focused solely on supermarkets as retail outlets (Mai and Zhao 2004; Min 2006; Theodoridis and Chatzipanagiotou 2009). Several studies explored the product attributes in supermarkets and traditional markets such as price, quality, and variety (Goldman and Hino 2005; Minten and Reardon 2008). However, there is a lack of adequate studies assessing and comparing both modern and traditional food retail outlets in terms of consumer food shopping frequency, especially in West Africa, and the corresponding development of consumer profiles. Therefore, the present study fills the gap with a unique and comprehensive, as permitted by gathered data, illustration of consumer's food shopping choice issue in Ghana. The identified consumer profiles in each food retail outlet type provide insights to private organizations. Food manufacturers, distributors/marketers, or potential food retailers gain knowledge essential for marketing strategy, including entry or expansion decisions. Furthermore, knowledge of food retail choices shows how various food retail formats are associated with consumer food selection, which affects consumer diet, nutrition, and eventually, health. This valuable information can be used by public agencies concerned about improving local diet, nutrition, and health by promoting certain healthy foods through different food retail outlets.

Food Retailing in Ghana

In the 1990s, the supermarket expansion spread to developing countries. Supermarket format appealed to consumers with adequate buying power. In East Africa, supermarkets developed from a tiny niche to an active food retail outlet in Kenya taking a fifth of food retail, while more than a third of their sales were from better off consumers (Neven et al. 2006). In South Africa, the number of supermarkets has been steadily growing, and has become a strong competitor for local stores (D'Haese and Huylenbroeck 2005). Regarding traditional food outlets, urbanites in Nigeria tend to buy their food from street vendors and hawkers (Nigeria 2013). Similarly, evidence suggests that expansion of the modern supermarket sector continues in Ghana, even though traditional food retail outlets such as open-air markets and street hawking remain important in food shopping. The latter two represent a significant part of the agri-food system that meets the needs of low-income and rural households (Reardon et al. 2004; Field et al. 2010).

McClelland's (1962) definition states, "Supermarkets are large self-service food shops." In our study, "supermarket" typically implies a larger grocery store owned by an independent proprietor. It also includes some large chain stores located in shopping centers. Supermarkets sell a wide variety of products such as dry goods, meats, bakery items, beverages, frozen foods, dairy products, and non-food goods, and provide food-processing services.

In Ghana, supermarkets sell high-quality organic and natural foods including freshly prepared meats, baked bread, and garden fresh produce, while a large number of products are imported. Also exotic, out-of-season fresh fruits and vegetables and processed fruits and vegetables are sold in supermarkets, consumption of which benefits consumers' health. Ready-to-eat food items such as pizza, burgers, fried rice, potato chips, and grilled/roasted/fried chicken are also provided in Ghana's supermarkets. Additionally, although the car ownership remains quite low-one vehicle for every 22 Ghanaians, the sale of cars experienced a substantial increase, 40 % in 2011, which likely contributed to the supermarket expansion (Ghana 2013). Currently, the domestically owned supermarkets dominate the supermarket sector. For example, Max Mart Limited, a subsidiary company of Kwatsons Ghana Limited, opened their first business operation on August 8, 2001; by the end of 2011, it had four branches in the greater Accra region (Kwatson Ltd. 2013). However, the country's economic growth is also encouraging international supermarket chain expansion. For instance, at the end of May 2013, Carrefour, the world's second-largest retailer, stated it would enter eight West and Central African countries including Ghana in the near future (Carrefour Group 2013).

The open-air market is a public marketplace selling food and merchandise. In Ghana, it is an integral part of the food retailing system (Field et al. 2010). Ghana is famous for its open-air markets. For example, Techiman's food market claims to be the largest food and agricultural market in West Africa, and Market Circle in Takoradi is also well known for their open-air markets. Some open-air markets operate every day, while others on a regular cycle. Most goods sold there are of domestic origin or locally produced foods, including fresh vegetables, fruits, and meat. Some markets, such as Makola Market located outside Accra, even offers live crab, chicken, and fish, which would not normally be sold in open-air markets. Although open-air markets lack cold storage facilities and proper protection of product freshness, they appeal to buyers with competitive prices and travel convenience.

Hawkers are persons traveling through towns and neighborhoods to sell goods. In large cities, they usually occupy major street intersections. Items sold by hawkers range "from plantain chips to chewing gum to book bags to live puppies" (Davis 2008). Most foods sold by hawkers are ready-to-eat or prepared food products for on-site consumption. Spicy foods and beverages are also sold by hawkers at reasonable and affordable prices (Johnson and Yawson 2000). In Ghana and most West African countries, hawkers are still a necessary part of the food retail system. Street hawking is both time and cost effective for consumers, since transactions can occur through buyer car windows, avoiding the potential troublesome travel to markets. Hawkers often sell food at competitive prices because the products are usually sold by item instead of bulk (Davis 2008). People lacking marketable skills, or employment, turn to hawking to earn income. Occasionally, even school children hawk to supplement their family earnings. Because of a lack of knowledge, education, and regulation, food sold by hawkers is potentially a source of public health problems due to microbial contamination (Toh and Birchenough 2000).

Food selection in each retail outlet does not vary greatly with locations; however, various locations add to the offered foods a few local items. For example, open-air markets in the city of Tamale tend to serve more local dishes such as boiled or stewed rice. In addition, due to the uneven economic development, local supermarkets are more concentrated in the southern Ghana in Accra and Takoradi than in the Northern Region e.g., in Tamale.

Conceptual Framework

Our study employs a utility-maximization model with the following assumptions: a) each household's utility depends on the quantity of both food products and non-food products they consume; b) the food shopping frequency in each food retail outlet is proportional to the corresponding quantity of purchased food products; c) in cross sectional data applications, after controlling for regional differences, prices of both food and non-food products are reasonably assumed to be stable.

Individual household wants to maximize the utility level by choosing the optimal quantity of both food and non-food products within the budget constraint (Equation 1 and 2):

$$(1) \qquad Max\ U = U(F_{\sup er}, F_{open}, F_{haw\,\ker}, NF)$$

$$(2) \qquad s.t.\ \mathrm{I} = \mathrm{P}_{\mathrm{F}_{\mathrm{super}}} \bullet F_{\sup er} + \mathrm{P}_{\mathrm{F}_{\mathrm{open}}} \bullet F_{open} + \mathrm{P}_{\mathrm{F}_{\mathrm{hawker}}} \bullet F_{haw\,\ker} + NF$$

where F's are food quantities purchased in each food outlet, NF is the non-food consumption quantity, and P's are the corresponding price indexes (the price of non-food goods are normalized). By solving the above constrained maximization model, the optimal consumption quantity is a function of price index, income, and the household preference parameter w (Equation 3). Here, k denotes different food retail outlet formats. It is worth noting that w captures the particular utility function form.

$$(3) \qquad F_k^* = f(P_{F_{\sup er}}, P_{F_{open}}, P_{F_{haw\,\ker}}, \mathrm{I}, \omega)$$

Given the price stability assumption, the optimal food shopping frequency Fre_k^*, which is positive and proportional to the corresponding food product quantity, is a function of both income and household preference parameter.

$$(4) \qquad Fre_k^* = f(\mathrm{I}, \omega \,|\mathrm{P}_{\mathrm{F}_{\mathrm{super}}}, \mathrm{P}_{\mathrm{F}_{\mathrm{open}}}, \mathrm{P}_{\mathrm{F}_{\mathrm{hawker}}})$$

Although household preferences are often unobservable, they can be shaped by socio-economic factors, such as education and occupation (McDowell et al. 1997; Bittencourt et al. 2007; Jolly et al. 2008), and demographic factors including age, gender, and household composition (Han and Wahl 1998; Ricciuto et al. 2006; Bittencourt et al. 2007; Quaye et al. 2009).

Data

This study uses data generated by a project focusing on the urban population in Ghana. For the purpose of learning about urban population food purchase and consumption habits, three cities were selected: Tamale, Takoradi, and Accra. The cities are located in two distinct ecological zones. Tamale is in the northern part of the country in the dry savannah zone, while Takoradi and Accra are in the coastal zone. Tamale and Takoradi are two centers of regional economic and cultural activity, while the inclusion of the greater Accra area was dictated by its sheer size and leading commercial role in the country. This selection also captures differences in regional

economic development and possible differences in household structure and behavior resulting from varying ethnicities in the local populations. Ethnic differences posed a challenge in data collection, since it required training a different set of enumerators fluent in the local languages (besides English) in the northern and coastal areas.

The data was collected using a survey instrument specifically developed from a larger project in Ghana. The survey instrument included several sections, and each was devoted to a different issue. One section was on general shopping habits, including questions about food expenditure, while other sections probed for the type of foods consumed and food attributes as well as consumption frequency of selected foods. Respondents were also asked about household characteristics such as income, education, and household size.

After the preparation of the questionnaire, data collection in the three cities took place between February and June, 2011. Households surveyed in Tamale were part of the sample surveyed by the National Statistical Service and the enumerators had previously participated in data collection through personal interviews there. Pilot testing of the questionnaire took place on the first day of data collection and did not reveal any potential problems in communicating issues or respondent difficulty in providing answers. During the following days, completed questionnaires were immediately reviewed for potential response errors and data were entered concurrently into a spreadsheet. Similar procedures were applied to data collection in Takoradi and Accra. Households in the two cities were selected based on the previous experience of the surveying team from earlier surveys. A total of 1,010 completed questionnaires were collected including 188 households in Tamale, 210 in Takoradi, and 612 in Accra.

Table 1A (see Appendix) shows the summary of the important descriptive statistics of the variables included in this study, and provides variable description and units of measurement. The respondents' ages range from 17 to 80 years old and the mean age is 39.2 years. More than 98 % of respondents are females, who are commonly in charge of food shopping and preparation in Ghana, and 75.3 % of respondents are married. Also, 64.2 % of respondents are self-employed, 24.2 % work in the government sector or civil departments, while the remaining 11.6 % are retired, students, or unemployed. In the month preceding the survey, the recorded income ranges from 5 Ghanaian cedis to 8,500 Ghanaian cedis with the mean of 646.6 Ghanaian cedis ($1 = 1.4965 Ghanaian cedi on May 1, 2011).

Empirical Model

Choice of food retail outlets and the patronage frequency related to each store format is assumed to reflect consumer purchasing behavior, which is further determined by certain key factors such as socio-economic and demographic characteristics. To explore the determinant of food retail outlet choice, three parallel equations are applied to examine the determinants of household food purchase frequency at each food outlet type (supermarkets, open-air markets, and hawkers). The shopping frequency at each food outlet is measured on a scale from one to five with the increasing number indicating more frequent shopping in a certain outlet type (i.e., 1=almost never, 2=once a month, 3=every other week, 4=once a week, 5=more than once a week), which is the dependent variable. The explanatory variables include socio-demographic characteristics

and location (i.e., household income, education, occupation, age, marital status, household composition, and regional location).

First, the ordinal logit regression model is applied in this study to investigate the socio-demographic factors effect on an urban household's food shopping frequency at each food outlet. Social science research commonly uses ordinal numbers to measure and quantify phenomena transformed into variables. The ordinal logit model, also known as the proportional-odds model, has been broadly applied to analysis of categorical data and has a simple interpretation of the odds ratio (Fullerton 2009). The basic framework of the ordinal logit regression is in Equation 5, where Y* is the latent variable behind the food shopping frequency, X denotes the selective explanatory variable vector, B is the coefficient vector, and e is the error term which is assumed to follow logit distribution.

$$(5) \quad Y^* = X\beta + \varepsilon$$

The relation between the latent variable Y* and the dependent variable Y is defined in Equation 6. When the latent variable is between particular cut points, the dependent variable is equal to a certain ordinal level, where Cut's are parameters needing to be estimated assuming $Cut_{i-1} < Cut_i$ (because of convenience in model expression, Cut_0 and Cut_5 are used to denote negative infinite and infinite) (Sajaia 2008). The probability of food shopping frequency equaling a certain number i can be expressed as the difference between two Cumulative Distribution Functions (CDFs) of logit distribution (Equation 7). For each food retail outlet format equation, the likelihood function of the empirical model (Equation 8) is the product of all possible probabilities with the indicator variable d as corresponding power, and N is the total sample size.

$$(6) \quad Y = i, \text{ if } Cut_{i-1} < Y^* < Cut_i, \text{ where i} = 1, 2, 3, 4, 5$$

$$(7) \quad \begin{aligned} \Pr ob(Y = i) &= \text{Prob}(Cut_{i-1} < Y^* < Cut_i) \\ &= \text{Prob}(Cut_{i-1} - \text{X}\beta < e < Cut_i - \text{X}\beta) \\ &= \text{F}(Cut_i - \text{X}\beta) - \text{F}(Cut_{i-1} - \text{X}\beta) \end{aligned}$$

$$(8) \quad Likelihood = \prod_j \prod_i \Pr ob(Y = i)^{d(Y=i)}, \text{ where j} = 1,2, \ldots \text{N},$$

$$\text{d} = 1 \text{ if Y} = \text{i; d} = 0 \text{ otherwise.}$$

Second, the marginal effects are further computed to quantify each significant socio-demographic factor's effect on the probability of each food shopping frequency level. For example, the marginal effects of income measure the change in the probability of shopping for food in each frequency category (i.e., almost never, once a month, every other week, once a week, and more than once a week) caused by a one-unit increase in income. The calculation equation can be seen in Equation 9 (Greene 2003).

$$(9) \quad \frac{d\Pr ob(Y = i)}{dX_l} = -\beta_l[\text{f}(Cut_i - \text{X}\beta) - \text{f}(Cut_{i-1} - \text{X}\beta)]$$

Results

Food Retail System Structure

The survey provides information about the shopping frequency in each retail outlet type. Among responding households, 7.3 % report shopping for food at supermarkets "more than once a week," 9.8 % "once a week," 8.4 % "every other week," 25.0 % "once a month," and the remaining 48.5 % "almost never." In terms of outlet type, given the above mentioned frequency categories, the proportions of households that report buying food in open-air markets are 36.3, 32.8, 16.3, 11.4, and 3.3 %, respectively; for "shop food from hawkers," the percentages are 16.5, 9.9, 11.9, 10.8, and 51 %, respectively. Based on the shopping frequencies for each food retail outlet type listed above, it is clear that the open-air market dominates the food retail system in Ghana. Nearly 70 % of responding urban households report shopping for food at least once a week in open-air markets.

As the oldest and most common food retail format, hawkers still play an active role in Ghana's food supply. About 16.5 % of households reported buying their food from hawkers more than once a week. Compared with the two traditional outlets, the supermarket has been accepted as one of the main food retail outlets by nearly twenty percent of the responding households, who buy their food from supermarkets "once a week" or "more than once a week".

Determinants of Food Shopping Frequency

According to the results from the ordinal logit estimation (Table 1), the demographic factors (i.e., marital status, age, household structure), socio-economic factors (i.e., income, occupation, and attained education level), and location are found to have a statistically significant effect in determining the food shopping frequency. Tables 2, 3, and 4 show the marginal effects of key factors associated with the food purchase frequency for each of three outlet types, i.e., supermarket, open-air market, and hawkers.

Supermarkets. Income has a significant positive influence on food shopping frequency in supermarkets. The result is consistent with a previous finding in Kenya (Okello et al. 2011). However, in our study, a 25 % growth of the household monthly income decreases the probability of "almost never" buying food in a supermarket by only one percent. Although income is an essential factor, the magnitude of its effect is still quite small.

Moreover, respondents with a secondary or college education are more likely to buy food in supermarkets frequently. This finding is similar to the result obtained in the study conducted in greater Tunis (Tessier et al. 2010). In the present study, respondents admitting to have a college education have a 14.4 % higher probability to patronize supermarkets "more than weekly." Well-educated households are more concerned about food quality and variety (Sanlier and Karakus 2010) and supermarkets can address their concerns. Supermarkets offer a wide choice of food items and the high quality standards and nutrition of procured products (Rao and Qaim 2011).

Table 1. Estimation results of the food purchase frequency by three outlet types in urban households of Ghana, 2011.

Variable name	Supermarket	Open-air market	Hawker
		Demographic factors	
Married	0.25349*	-0.24350*	0.04522
	(0.151)	(0.142)	(0.149)
Age	-0.00431	-0.01200**	0.00704
	(0.006)	(0.006)	(0.006)
Age_3	-0.02985	0.16904*	0.20744**
	(0.102)	(0.10348)	(0.104)
Age_12	-0.07427	0.09581	0.02942
	(0.063)	(0.06008)	(0.060)
Age_18	-0.05023	0.06092	-0.02516
	(0.055)	(0.053)	(0.054)
Age_60	0.08472**	0.09567**	0.11536***
	(0.038)	(0.038)	(0.037)
Age_61	-0.03926	0.02435	0.12588
	(0.122)	(0.119)	(0.126)
		Socio-economic factors	
Income	0.00022***	-0.00009	-0.00040***
	(0.000)	(0.000)	(0.000)
Employ_self	-0.08531	-0.38872**	-0.01709
	(0.198)	(0.193)	(0.200)
Employ_gov	0.20216	-0.32851	-0.13058
	(0.228)	(0.224)	(0.238)
Educ_sec	0.87222***	-0.15811	-0.17102
	(0.144)	(0.139)	(0.144)
Educ_col	1.52828***	-0.93490***	-0.627**
	(0.225)	(0.216)	(0.249)
		Location	
Tamale	0.07856	0.09129	1.10924***
	(0.183)	(0.175)	(0.175)
Takoradi	0.78090***	-0.39179**	0.61091***
	(0.159)	(0.155)	(0.161)
Cut1	0.79496	-4.54563	0.600
	(0.359)	(0.397)	(0.362)
Cut2	2.04273	-2.78762	1.11436
	(0.365)	(0.359)	(0.364)
Cut3	2.66764	-1.73911	1.75667
	(0.36961)	(0.353)	(0.367)
Cut4	3.66458	-0.25385	2.416
	(0.382)	(0.347)	(0.370)

Note. *, ** and *** denote significant at 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses.

Table 2. Marginal effects in food purchase frequency of supermarkets.

Variable name/ dy/dx	Almost never	Once a month	Every other week	Once a week	More than once a week
			Demographic factors		
Married*	-0.0632387 (0.03756)	----------	0.0147729 (0.00876)	0.0169546 (0.00977)	0.0135593 (0.00771)
Age_60	-0.0211027 (0.00939)	0.0054482 (0.00252)	0.0049871 (0.00228)	0.00588 (0.00267)	0.0047874 (0.00217)
			Socio-economic factors		
Income	-0.0000555 (0.00002)	0.0000143 (0.00001)	0.0000131 (0.00001)	0.0000155 (0.00001)	0.0000126 (0.00000)
Educ_sec*	-0.2121363 (0.03359)	0.0435194 (0.00876)	0.0500256 (0.00921)	0.0636016 (0.0119)	0.0549896 (0.01113)
Educ_col*	-0.3300998 (0.038)	----------	0.06942 (0.0092)	0.1264217 (0.02123)	0.1442641 (0.03269)
			Location		
Takoradi*	-0.1872556 (0.03586)	0.0276917 (0.00639)	0.0445592 (0.00954)	0.0604423 (0.01423)	0.0545624 (0.01416)

Note. This table only reports the results at 10% significance level. Standard errors are in parentheses; (*) dy/dx is for discrete change of dummy variable.

Table 3. Marginal effects in food purchase frequency of open-air markets.

Variable name/ dy/dx	Almost never	Once a month	Every other week	Once a week	More than once a week
			Demographic factors		
Married*	0.0055726 (0.00322)	0.0205246 (0.01152)	0.0233722 (0.0136)	----------	-0.0562913 (0.03327)
Age	0.0002908 (0.00016)	0.001056 (0.00054)	0.0011583 (0.00059)	----------	-0.0027301 (0.00138)
Age_60	-0.0023241 (0.001)	-0.0084385 (0.00338)	-0.0092564 (0.00372)	----------	0.0218166 (0.00864)
			Socio-economic factors		
Employ_self*	0.0089824 (0.00454)	0.0329462 (0.01591)	0.0372042 (0.01837)	----------	-0.0895679 (0.04485)
Educ_col*	0.0321641 (0.01141)	0.1017855 (0.02837)	0.0814316 (0.01619)	----------	-0.1854857 (0.03607)
			Location		
Takoradi*	0.0106317 (0.00503)	0.0372135 (0.01592)	0.0373742 (0.01475)	---------	-0.085626 (0.03248)

Note. This table only reports the results at 10% significance level. Standard errors are in parentheses; (*) dy/dx is for discrete change of dummy variable.

Table 4. Marginal effects in food purchase frequency of hawkers.

Variable name/ dy/dx	Almost never	Once a month	Every other week	Once a week	More than once a week
			Demographic factors		
Age_3	-0.0518047	0.0040733	0.0112732	0.0126589	0.0237993
	(0.02592)	(0.00221)	(0.00576)	(0.00645)	(0.01198)
Age_60	-0.0288084	0.0022651	0.006269	0.0070396	0.0132347
	(0.00931)	(0.00088)	(0.006269)	(0.00238)	(0.00431)
			Socio-economic factors		
Income	0.0000991	-7.79e-06	-0.0000216	-0.0000242	-0.0000455
	(0.00003)	(0.00000)	(0.00001)	(0.00001)	(0.00001)
Educ_col*	0.152306	-0.0192142	-0.0365495	-0.03569	-0.0608523
	(0.05764)	(0.01018)	(0.01522)	(0.0133)	(0.02046)
			Location		
Tamale*	-0.2654835	----------	0.0395799	0.0646276	0.1628604
	(0.03819)		(0.0061)	(0.01075)	(0.03174)
Takoradi*	-0.1510829	0.0053541	0.0283664	0.0374848	0.0798776
	(0.03894)	(0.00242)	(0.00694)	(0.01026)	(0.02385)

Note. This table only reports the results at 10% significance level. Standard errors are in parentheses; (*) dy/dx is for discrete change of dummy variable.

Furthermore, respondents from married households are found to purchase food more frequently in supermarkets, and have a six percent lower probability in "almost never" patronizing supermarkets than households of the unmarried. The finding differs from an earlier study conducted in Turkey, which indicated that supermarkets appeal equally to married and unmarried shoppers (Kaynak and Borak 1981). The current study result is consistent with a study of Chinese consumer behavior, which suggests that the positive relation between married status and supermarket patronage is due to the required single shopping trip (Mai and Zhao 2004).

In addition, household size has a positive influence on food shopping frequency in supermarkets. One additional adult increases the probability of buying food in supermarkets "more than once a week" by 4.8 %. Large households, especially those consisting of two or three generations, may demand a wide range of foods (Florkowski et al. 2002). The wide diversity of products including both food and non-food items make a supermarket the most convenient one-stop store for large households. Furthermore, results indicate that the appeal of supermarkets varies by location. Comparing with Accra households, households in Takoradi are more likely to shop for food in a supermarket, plausibly because Takoradi is a large port and commercial center of Ghana.

Open-air markets. Occupation has a significant effect on food shopping frequency in open-air markets. Compared with the unemployed, students, the retired, or the self-employed buy foods less frequently in the open-air markets. Because of the possible flexible work time, the self-employed households may spend some time in cultivating back-yard gardens to supplement their food needs.

Moreover, college-educated households have an 18.5% lower probability of shopping "once a week" for food in open-air markets, because an open-air market may not meet their high

expectations for food quality. In addition, married households are found to buy food less often at the open-air markets. Compared with unmarried households, married households have a 5.6% lower probability of patronizing open-air markets for food shopping more than weekly. It is plausible that married households demand more diverse foods and the open-air markets, providing only locally produced food products, cannot satisfy their needs.

Food needs decrease with advancing age. The likelihood of purchasing food in open-air markets "more than weekly" decreases significantly with the respondent's age. The result supports the finding of a significant relationship between age and frequency of visits to open-air markets in Hungary (Czakó and Sik 1999). In the case of the present study, 10 years added to a respondent's age decreases the probability of shopping for food "more than once a week" in open-air markets by 2.7%.

Larger households shop for foods in open-air markets more frequently. Because a large household demands a high volume of individual food products, the need for large quantities of food is easily satisfied in open-air markets because fewer foods are prepackaged or sold in uniform size packages. The presence of an additional adult in a household increases the likelihood of food shopping in an open-air market "more than weekly" by 2.2%. Location also influences the shopping frequency of open-air markets. A Takoradi household shops for food less often with a 6.5% lower probability than an Accra household in open-air markets. It appears that open-air markets appeal less to Takoradi residents.

Hawkers. Higher income households buy food items less often from hawkers than lower income households. A 25% increase in household monthly income would decrease the probability of buying food from hawkers by 1.6%. The finding of this study confirms that income significantly influences where consumers shop (Goldman et al. 1999). Furthermore, the college-educated respondents buy less frequently from hawkers, and have a 15.2% higher probability of "almost never" buying food from hawkers than respondents with less education. Due to low quality and narrow selection, hawker-sold foods could be unattractive to well-educated households.

The number of very young children (younger than 3 years old) and the number of adult household members (19-60 years old) both have a positive effect on the food shopping frequency from hawkers. Most foods sold by hawkers are ready-to-eat or prepared foods such as bagged roasted peanuts, which may appeal to households with small children. Also, households with a large number of adults have a higher demand for ready-to-eat food, because adults are likely to work. When traveling to and from work they are likely to purchase snacks and beverages from hawkers as suggested by casual observations.

Both Tamale and Takoradi residents have a higher food shopping frequency from hawkers than Accra-located households. Hawkers seem to be quite numerous outside the capital. At present, the development of Ghana's urban areas is still uneven, and hawkers adapt to various environments; in the capital they are quite visible along major routes and main intersections, while in other cities they may be more mobile and travel through neighborhoods rather than limiting their presence to heavily traveled roads.

Consumer Profile, Food Retail Outlet Choice, and Diet and Health

Results of the study indicate that supermarkets are preferred by high-income and well-educated households especially in the city of Takoradi. Because a typical supermarket has a wide selection of food products, households that frequently shop in supermarkets are more likely to be exposed to a number of healthy food products that might not be traditional to the Ghanaian diet. Offerings may include but are not limited to out-of-season vegetables and fruits or international products with high nutritional density. However, frequently, supermarket shoppers are also likely to purchase high-calorie food items including potato chips, burgers, and pizza, which have been linked to potential weight and obesity problems.

Open-air markets are found to continue to dominate the food retail system in Ghana, with 70 % of households reporting to patronize them "once a week" or "more than once a week". Open-air markets are traditional food outlets particularly attractive to large households in Accra. Thus, it is the larger households that are more likely to consume domestic and local food products including in-season vegetables and fruits, and purchase live poultry and locally supplied fish.

The mobile hawkers offering convenient shopping are more likely to attract food purchases by low-income and less-educated large households especially those having small children. Therefore, convenience foods including mostly of ready-to-eat and some food snacks sold by hawkers are more likely to be purchased by households of a lower socio-economic status than households of the better educated or higher income.

Conclusions and Implications

The expectations regarding food quality, selection, and service are growing among African consumers. The expansion of modern food retail outlet types, such as supermarkets, has begun in West Africa in recent years. Previous studies have investigated the influence of supermarket expansion from various perspectives. However, due to data limitations, very few researchers have explored the changing retail outlets from the consumer viewpoint. Modern food retailers need comprehensive information about the food supply chain to make entry or expansion decisions, while traditional food retailers need suggestions to improve their products and service to keep their business economically viable. In addition, policy makers concerned about improving consumer diets need insights to guide their strategies by recognizing the consumer group profile of each food retail outlet. Local food formats vary substantially by neighborhood demographic and socio-economic composition (Moore and Diez Roux 2006).

Different food retail formats affect consumer diet and nutrition through the food products and services they provided (Hawkes 2008; Tessier et al. 2010). This study assessed the relative importance of different food retail outlets (i.e., supermarkets, open-air markets, and hawkers, identified the socio-demographic profiles of consumers associated with shopping in each retail format, and then illustrated how the food retail outlet choices might affect consumer diet and nutrition, using the surveyed data set collected in 2011 from three big cities in Ghana (Accra, Tamale, and Takoradi).

The Relative Importance of Different Food Retail Outlets

Results of food shopping frequencies indicate that the traditional open-air markets still dominate the food retail system in Ghana. Only 3.3% of households reported that they never shop for foods in open-air markets. A large number of basic and inexpensive food products are sold in open-air markets, and it remains an integral part of the food supply chain.

Hawkers, as a traditional food retail format, fill a niche to meet consumers' specific demand for ready-to-eat foods, and attract buyers by offering shopping convenience.

As a modern food outlet, supermarkets have been gradually accepted by urban households, and the results indicate that about 17% of households purchased food in supermarkets at least weekly. Currently, supermarkets provide a wide variety of high-quality food item, and play a dynamic role in the food supply of Ghana.

Implication for Food Marketers

This study provides a broad understanding of consumer profiles and their food shopping frequency in three main food retail outlets. The gained insights facilitate the examination of an urban household's choice among food outlet types by revealing their food shopping habits and preferences, an essential prerequisite for food sales. Supermarkets have been adopted as a food retail outlet by high-income and well-educated households, especially large married households from developed urban areas. To attract additional buyers, modern food retailers may need to keep and enhance their advantage by providing quality, variety, and service. Modern retailers provide potential consumers with product or promotion information and encourage them to try the new shopping experience in supermarkets.

In spite of the expanding presence of supermarkets in West Africa, the open-air market remains a major outlet in the agri-food supply system. The open-air markets especially meet the needs of less-educated households by offering convenience and availability of inexpensive basic foods. Large households of retired or unemployed households also frequently shop in open-air markets. To retain their dominant market share, open-air market traders may need to employ strict guidelines and adopt necessary storage/protection technology to enhance food quality and the shopping environment.

Large-size, low-income, or less-educated households with small children, especially those in a non-capital area, tend to buy foods from hawkers because of the convenience and relative price. Street hawkers may retain their shopper base by providing additional ready-to-eat foods such as snack foods and beverages to attract on-site consumption.

Implications for Public Sector

Supermarkets play an increasingly substantial role affecting the diet of urban Ghana households through their mix of offerings. High-income and well-educated households, who shop regularly in supermarkets, are more likely to consume healthy food items including imported vegetables and fruits, as well as new highly nutritious food products. The wide food selection in a supermarket offers households who frequently shop there a balanced diet. Nevertheless, these

frequent supermarket shoppers are also at a relatively high risk of unhealthy weight gain because calorie-dense food items such as potato chips and chicken are also offered in supermarkets. However, policy makers need to keep in mind that the effect of any nutrition or diet intervention in modern food outlets is still limited in terms of consumer population, and those interventions generally reach only those who shop in supermarkets regularly.

The traditional food retail outlets such as open-air markets and hawkers remain essential elements in the food supply system of Ghana. Specifically in open-air markets, households can access most locally produced foods including in-season fresh vegetables and fruits. Large households, especially those with small children, buy frequently from hawkers. Therefore, monitoring the traditional food outlets is crucial to gauge food access and advance consumer diet and health, especially among low-income households in Ghana's less-developed regions. There is a need for public agencies to continue efforts to reduce the threat of food-borne diseases, by encouraging proper handling and storage of food.

Limitations of the Study

The food format's influence on consumer diet, nutrition, and health varies across countries and areas, and is affected by numerous factors including the local food retail system, the level of economic development, and consumer food purchases, perceptions, and culture. Therefore, the implications that any food retail format has positive or negative effects on consumer diet and health are uncertain. The present study illustrates implications for diet in terms of available foods in each food outlet and the profile of consumers regularly patronizing any of the three food outlet types. Future studies are needed to fully address the correlation between food availability and actual consumer purchase in each food outlet.

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Appendix

Table 1A. Descriptive statistics of variables included in the empirical model.

Variable name	Variable description / units of measurement	Mean	Std dev
Dependent variable:			
Freq_market	How often do you buy food products in the market? Almost never=1; once a month=2; every other week=3; once a week=4; more than once a week=5	3.870	1.100
Freq_super	How often do you buy food products in the supermarket? Almost never=1; Once a month=2; Every other week=3; Once a week=4; More than once a week=5	2.056	1.292
Freq_hawker	How often do you buy food products from the hawkers? Almost never=1; once a month=2; every other week=3; once a week=4; more than once a week=5	2.272	1.538
Independent variables:			
	Demographic factors		
Married	=1 if a respondent is married	0.753	0.431
Age	Actual age in years	39.222	10.656
Age_3	Number of household members 3 years old or younger	0.363	0.645
Age_12	Number of household members between 4-12 years old	0.945	1.067
Age_18	Number of household members between 13-18 years old	0.983	1.205
Age_60	Number of household members between 19-60 years old	2.087	1.751
Age_61	The squared number of household members 61 years old or older	0.153	0.505
	Socio-economic factors		
Income	Household income in the month preceding the survey / in Ghanaian cedis	646.070	785.081
Employ_self	=1 if a respondent is self-employed	0.642	0.480
Employ_gov	=1 if a respondent is gov/civil employee	0.243	0.429
Educ_sec	=1 if a respondent has a secondary education (including Senior high/GCE O-A level, Vocational school, Technical school, or Teacher training)	0.382	0.486
Educ_col	=1 if a respondent has a college education (including university postgraduate)	0.134	0.340
	Location		
Tamale	=1 if a household is in Tamale	0.186	0.389
Takoradi	=1 if a household is in Takoradi	0.208	0.406

