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Consumer Demand and Willingness to Pay for Safe Food in Accra, Ghana

Implications for Public and Private Sectors' Roles in Food Safety Management

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Notices

ABSTRACT

Consumer demand for food safety is likely to be an important driver of public policies and industry-led efforts to reduce information asymmetry on food attributes and improved food safety. This paper examines the attribute demand for chicken meat and tilapia among 803 shoppers in Accra, Ghana. Freshness is the main attribute demanded by the overwhelming majority of shoppers, followed by food safety, price, taste and size. Consumers are willing to pay price premiums for food safety certifications, i.e., those certified according to Hazard Analysis and Critical Control Point (HACCP) principles or certified as free of antibiotic residue. However, the price premium shoppers are willing to pay for improved food safety vary by shoppers type. A third of tilapia shoppers and half of chicken meat shoppers are classified as food safety conscious shoppers and willing to pay a 10 to 12 percent higher price than noncertified products. In comparison, only a tenth of shoppers are considered to be price conscious and willing to pay a small premium (< 1 percent) for certified safe foods. We also tested an information treatment on the negative health implications of food contamination and its effect on shoppers' decisions. The information treatment randomly assigned to shoppers was a significant predictor of food safety attribute demand for chicken meat but not for tilapia, which may be linked to greater awareness of and concern about antibiotic misuse in poultry production. Our findings generally point to a concern about food safety and a strong demand and willingness among consumers to pay premiums for certified safe foods, thus providing support for public- or industry-led schemes to provide food safety information to consumers.

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1. Introduction

Food-borne diseases (FBD) are major public health concerns and significant impediment to socio-economic development. FBD were associated with the worldwide loss of 33 million disability-adjusted life years (DALYs) in 2010, with children under five years old bearing 40 percent of this burden (Havelaar et al. 2015). Low and middle-income countries have higher prevalence of FBD and are particularly at high risk due to weak capacity, limited resources, and weaker formal institutions for monitoring and prevention of FBD (Havelaar et al. 2015; Grace 2015). Risks are also higher in urban than in rural areas with longer distribution, handling and cross-contamination of foods and with the dominance of street food vendors and open traditional markets, often tested for high prevalence of biological hazards (Yeleliere, Cobbina and Abubakari 2017). For example, in rapidly-urbanizing Ghana, the study site for this paper, 625,000 cases and 90,000 deaths are reported annually (Yeleliere, Cobbina, and Abubakari 2017) and several studies show a high prevalence of pathogens, including *Salmonella, Listeria,* and *E. coli* O157:H7 in meat, fish, milk, fruits, and vegetables in urban markets (Sackey et al. 2001; Donkor et al. 2008; Aboagye 2016; Quansah et al. 2018). Researchers have also found unhygienic food-handling practices in farms and markets and a high prevalence of disease-causing pathogens in street foods (see review by Saba and Gonzalez-Zorn 2012 and Yeleliere, Cobbina, and Abubakari 2017). Overuse and misuse of antibiotics in poultry rearing and the resulting risk of antimicrobial resistance is a serious public health concern (Donkor et al. 2018; Boamah et al. 2016; Donkor, Newman, and Yeboah-Manu 2012; Kunadu et al. 2018).

Food contamination events are regularly covered in the media in Ghana. A recent wide media coverage was on the several deaths recorded in the Volta and Eastern regions from the consumption of puffer fish and the consequent extensive awareness campaign by Ghana's Food and Drugs Authority (FDA).[1] The overuse and misuse of antibiotics in livestock, particularly chicken, is also increasingly becoming a popular subject in the media.[2] Preliminary fieldwork by the research team shows strong concern among consumers about the misuse and overuse of antibiotics used in poultry production and its impact on human health.

Ghana's policymakers have recently made some efforts toward better food safety regulation and management. In early 2018, four relevant government ministries in Ghana launched the National Action Plan for the Antimicrobial Use and Resistance Policy. Regulatory efforts have been stepped up including market day fairs to educate vendors in informal markets, stricter inspection for harmful chemicals and closing shops and stores that are not in compliance, requiring all food-processing firms to comply with Good Manufacturing Practices (GMP) certification or renew their facility license every year, and requiring health certificates and various training sessions for street vendors. A Food Safety and Nutrition Training Center was set-up in 2008 at the University of Ghana for education on HACCP and other food safety systems. The National Food Safety Policy drafted and adopted by stakeholders in 2015 aims to strengthen institutional coordination of key stakeholders, infrastructure, and human capacity, as well as to establish a food-borne disease surveillance system. Despite these efforts, food safety remains a critical concern given the weak enforcement, scalability, and sustainability of these efforts. Recognized gaps are seen in the lack of coordination among regulatory and enforcement agencies at various levels, weak partnership and co-regulation with the private sector, and poor understanding of consumers' influence and

[1] https://www.myjoyonline.com/news/2018/January-5th/kpando-one-dead-six-hospitalised-after-eating-poisonous-fish.php; https://www.adomonline.com/ghana-news/two-dead-after-consuming-puffer-fish/.
[2] http://www.fao.org/ghana/news/detail-events/en/c/1127767/; https://www.myjoyonline.com/news/2018/April-27th/antimicrobial-policy-will-fail-unless-govt-employs-more-vets-group-warns.php; https://www.myjoyonline.com/lifestyle/2018/February-22nd/scientists-warn-of-unregulated-antibiotic-use-in-animals.php.

purchasing behavior. The latter two are particularly important in co-regulation, better enforcement, and cost-sharing for food safety.

This study aims to address some of these gaps by examining how consumers could help share the cost of food safety. We focus on consumer awareness of food safety issues and their demand and willingness to pay for certified safer food. Food safety issues often arise from problems of asymmetric information between consumers and producers of food with regard to product-specific attributes or characteristics (i.e., credence goods). As noted by Grunert (2005), consumer awareness or perception of food safety can be an important driver of decisions made by both food producers and consumers. Government or other third-party certification and traceability networks are examples of systems used to help bridge the information gap between market players and reduce inefficiencies that arise from asymmetric information. As measures of safe food for this study, we focus on two certification systems that the regulatory bodies in Ghana, the Ghana Standards Authority (GSA) and the FDA, have started implementing and have plans to scale up in the future: antibiotic-residue-free certification in meat and the Hazard Analysis and Critical Control Point (HACCP) system. This study aims to inform agribusiness strategies toward food safety management and contribute to the implementation plan of the National Food Safety Policy in Ghana.

This study contributes to the scarce literature on consumers' willingness to pay for food safety particularly in the developing-country setting. While the use of choice experiments to study consumer preferences in general has increased in recent years (Ouma, Abdulai, and Drucker 2007; Nilsson, Foster, and Lusk 2006; Tonsor, Olynk, and Wolf 2009; Olynk, Tonsor, and Wolf 2010) and there have been applications to the topic of food safety preferences (Ortega et al. 2011; Ortega, Wang, and Widmar 2014), the approach has been rarely used to study consumer preferences and demand for food safety in developing countries, especially in sub-Saharan Africa, where the public institutions have a lower capacity for monitoring and enforcing food safety regulations. De Groote et al. (2016) used the Becker–DeGroot–Marschak auction approach to elicit willingness of consumers in rural Kenya to pay for maize without mold or aflatoxins and found high awareness of contamination as well as a premium on food safety. Probst et al. (2012) and Yahaya, Yamoah, and Adams (2015) analyzed willingness to pay in the context of vegetables in Ghana, and Owusu-Sekyere, Owusu, and Jordaan (2014) found positive willingness to pay for food safety certification of beef in two Ghanaian cities.

We contribute to the existing literature by focusing on and comparing consumer preferences for attributes of chicken meat and tilapia, two products expected to see increasing demand as the West African populace becomes more urban than rural, and we also assess the effects of providing food safety information to consumers, a signal of the likely effects of public health campaigns. The focus on Ghana, a country that has recently seen rapid urbanization and rising incomes with associated changes in diets, can provide important lessons for other urbanizing countries, particularly in sub-Saharan Africa. In Ghana, chicken meat consumption has increased significantly over the past 20 years, from an annual average consumption of 1.26 kilograms per capita in the mid-1990s to an annual average consumption of 6.66 kilograms per capita annually (average for 2011–2015) based on Ghana Living Standards Survey 6 (GLSS6) data. Although there are no comparable data for tilapia, fish consumption is generally high as well, at 25 kilograms per capita annually, compared to a global average of 15 kilograms per capita (Ragasa et al. 2018).[3]

The objective of this research, then, is to assess urban consumer preferences for select food safety attributes in Ghana. Specifically, we use a choice experiment approach, examine preference heterogeneity using a latent class model, and examine the effect of an information treatment emphasizing details of the

[3] Ghana has also experienced rapid urbanization with implications on changing consumer diets and preferences towards more fruits and vegetables that are among the nutrient-rich foods.

prevalence and negative impacts of food contamination through analysis of a survey of 803 shoppers in Accra, Ghana. The specific research questions are these:

1. What types of consumers are concerned about and demand food safety?
2. What is the willingness to pay for foods certified as safe among diverse types of consumers?
3. What is the effect of consumer education, specifically providing information on the negative impacts of food-borne illness and the prevalence of disease-causing pathogens in the markets, on consumer demand and willingness to pay for safer food?

We find reasonably strong evidence confirming the importance of chicken meat and tilapia in the diets of urban consumers, based on frequency of purchase and consumption. Food safety is one of the highest-ranked attributes considered by respondents, and the food safety demand attribute is invariant to income. It is, however, dependent on the type of product and the type of contaminant. The information treatment (on the negative health implications of food contamination) that was randomly assigned to shoppers was a significant predictor of food safety attribute demand for chicken meat but not for tilapia, which may be linked to greater awareness of and concern about antibiotic misuse in poultry production. We structured the theoretical framework, methods, evidence and results as follows. Section 2 explains the theoretical framework for analyzing consumers' willingness to pay for product attributes including food safety. Section 3 describes the data and methods, and section 4 presents the results. In section 5 we conclude with a discussion of policy implications.

2. Theoretical Framework and Econometric Modeling

The theoretical framework of this research is rooted in Lancaster's approach to consumer theory. Breaking from the traditional view that utility is derived from a good, Lancaster proposed that a good, per se, does not give utility to the consumer. Rather, a good possesses characteristics, and those characteristics give rise to utility. Furthermore, Lancaster generalized that goods can possess multiple characteristics that can be shared by multiple goods and that goods in aggregate can possess characteristics different from those pertaining to the goods separately (Lancaster 1966). In the present context, chicken meat and tilapia, the goods of interest, can be viewed as a collection of their food safety informational attributes such as certifications they possess, country of origin, freshness, and price. Following Lancaster, a consumer with preferences over each of the aforementioned characteristics will choose the bundle of attributes of the good that maximizes his or her utility subject to a budget constraint.

Choice experiments closely simulate real-world purchasing decisions where a consumer has to select a product from a set of options. Several studies have documented the advantages of using choice experiments over other revealed preference experimental methods, including their conformity to random utility theory and Lancaster's approach to consumer theory (Lusk and Schroeder 2004; Carlsson, Frykblom, and Lagerkvist 2007). Researchers have found no statistically significant difference between the results obtained from choice experiment (stated preference) data and those from actual (revealed preference) data (Adamowicz et al. 1998; Carlsson and Martinsson 2001). Various studies have shown that using a cheap talk script (see Cummings and Taylor 1999) as an introductory statement before starting the interview, in order to frame a respondent's mind to translate the hypothetical scenarios to real-life decisions, emphasizes the importance of the study and the need to focus on budget constraints and reduces hypothetical bias (see Annex 2 for the cheap talk script used for this study).

Choice experiments are based on the assumption that individual n obtains utility [U_{nit}] from selecting alternative i from a finite set of J alternatives contained in choice set C in situation t. Utility is composed of a deterministic component [V_{nit}], which depends on the attributes of an alternative, and a stochastic component [e_{nit}].

The utility of alternative *i* can be specified as

$$U_{nit} = V_{nit} + \varepsilon_{nit} \ .$$

Therefore individual *n* will choose alternative *i* if $U_{nit} > U_{njt}$, $\forall j \neq i$. Consequently, the probability of individual *n* choosing alternative *i* is given by

$$P_{nit} = P\left[\left(V_{nit} + \ \varepsilon_{nit} \geq \ V_{njt} + \varepsilon_{njt}\right); \ \forall j \in C, \forall j \neq i\right].$$

Unlike the traditional logit model where consumers are assumed to be homogeneous, heterogeneity in consumer preferences for food safety informational attributes is measured using a latent class model. The latent class model is being increasingly used in applied economic research as an approach to account for differences in consumer preferences (Tonsor, Olynk, and Wolf 2009).

The deterministic component of utility $[V_{nit}]$ in the random utility model takes the form of

$$V_{nit} = \beta' X_{nit} \ ,$$

where β' is a vector of random parameters, which has its own mean and variance, representing individual preferences, and X_{nit} is the vector of attributes found in the *i*th alternative (in our study, X_{nit} are country of origin, freshness, food safety certification systems [HACCP and antibiotic-residue-free certification], and price). Following Train (2003), the probability that individual *n* chooses alternative *i* from the choice set *C* in situation *t* is given by

$$P_{nit} = \int \frac{\exp(V_{nit)}}{\sum_j \exp(V_{njt)}} f(\beta) d(\beta) \ ,$$

where we can specify the distribution of the random parameter *f(.).* If the parameters are fixed at β_c (nonrandom), the distribution collapses, that is, $f(\beta_c) = 1$ for $\beta = \beta_c$, and 0 otherwise.

Alternatively, heterogeneity in preferences can be assumed to occur discretely using a latent class approach where the *N* individuals are sorted into a number of *S* latent classes, each composed of homogeneous consumers (Boxall and Adamowicz 2002). In the latent class logit model, *f(β)* is discrete, taking *S* distinct values (Train 2003). The probability that individual *n* selects option *i* in a given choice situation *t* unconditional on the class is represented by

$$P_{nit} = \sum_{s=1}^{s} \frac{\exp(\beta_s{}' X_{nit})}{\sum_j \exp(\beta_s{}' X_{nit})} R_{ns} \ ,$$

where β_s is the specific parameter vector for class *s*, and R_{ns} is the probability that consumer *n* falls into class *s*. This probability can be modeled as in the following (Ouma, Abdulai, and Drucker 2007):

$$R_{ns} = \frac{\exp(\theta_s{}' z_n)}{\sum_r \exp(\theta_s{}' z_n)} \ ,$$

where z_n is a set of observable characteristics that affects the class membership for consumer *n*, and θ_s is the parameter vector for consumers in class *s*.

3. Data Sources and Methods

This study focuses on urban consumers in Ghana's capital, Accra, and covers chicken meat and tilapia, both of which are widely consumed across all income groups and most vulnerable in terms of biological and chemical food hazards. To identify relevant food safety attributes in these products, a shopper exit survey was conducted in June 2018. Four two-level attributes were selected to be included in the choice experiment: country of origin, HACCP certification, antibiotic-residue-free certification, and freshness (see Table 1 for details). The attributes were chosen based on preliminary studies and interviews with key value chain actors for the respective products. Prior to the final survey the questionnaire and the choice sets were developed and pretested in two different markets to ascertain the suitability of the questions and the choice sets. Different price levels were also offered in the choice sets. The prevailing market price for each product was used in calibration of price ranges that are used in the experimental design.

Table 1. Attributes of chicken meat and tilapia used in the choice experiment

Product	Chicken (cut thigh parts)	Tilapia (whole, regular-sized)
Country of origin	• Ghana-produced • Imported	• Ghana-produced • Imported
Freshness	• Fresh • Frozen	• Fresh • Frozen
Food safety system	• HACCP-certified • No claim	• HACCP-certified • No claim
Test for antibiotic residue	• Antibiotic residue free • No claim	• Antibiotic residue free • No claim
Price range (GHS/kg)	8–30	6–25

Source: IFPRI consumer exit survey (2018).
Note: Photos/illustrations were used in the actual survey. These attributes, including the range of possible prices, were selected based on in-depth interviews with consumers, vendors, government officials, and other actors. GHS = Ghanaian cedi.

A full factorial experimental design including all possible combinations of the four attributes at two levels and six levels of price and with two alternatives to choose between would require the use of $((2^4)(6^1))^2$ or 9,216 choice sets. Since it is not practically feasible to work with this number of choice sets, a fractional factorial design was used. Sawtooth Software (also known as SSI) was used to obtain an eight-choice scenario and D-optimal design that allowed for the estimation of all main effects. We also included an opt-out (no purchase) choice. SSI provides a computer-assisted personal interview (CAPI) application with advanced analytics and insights to help organizations understand what's vital to consumers and predict what they will buy or choose through the choice-based conjoint analysis module. The software allows respondents to be presented with multiple product scenarios with attributes to aid in selecting preferred choices. SSI has been increasingly used in choice experiment design and with the CAPI application in various publications (see Kowalewski, McLennan, and McGrath 2011; Rudd 2011).

We also are interested in understanding the effect of consumer education on demand and willingness to pay for food safety. Specifically, we used an information treatment that provides detailed information on the negative impacts of food-borne illness and the prevalence of disease-causing pathogens in the markets, in addition to introducing potential food safety certifications, such as the HACCP principles and a test for antibiotic residue, conducted by the FDA and the GSA. The latter was the only information provided to the control group. Details of the information treatment are provided in Annex 1. The shoppers were randomized to be in the information treatment or control group.

Through a consumer exit survey, a total of 803 consumers (403 chicken meat shoppers and 400 tilapia shoppers) were interviewed in a sample of major traditional open-air markets, supermarkets, shops, and specialized live-bird markets and tilapia outlets. To ensure the selection of markets in Accra provided a balanced representation of prices and market conditions for the two products under consideration, the research team carried out a preliminary scoping visit to identify the various markets and major sales outlets for chicken meat and tilapia. Annex Table 1 gives details on the total number of sampled shoppers from each type of market for each product. Within these focus markets, participants for the exit survey were sampled using the shopper-intercept sampling procedure, where shoppers are randomly approached and upon completion of an interview the enumerator approaches the next available shopper.

The survey consisted of face-to-face interviews conducted using CAPI-based questionnaires. The interviews took about 15 minutes each, and they were implemented by a team of 20 enumerators and supervisors. The survey consisted of three parts. In the first section, the respondents provided responses to the choice experiment questions. The choice experiment was designed with information treatments to provide insight into how consumers respond to being provided with adequate information. The second section involved questions on general respondent consumption habits, knowledge, and perception with respect to the specific product (chicken meat or tilapia). The third section contained questions on the sociodemographic characteristics of the respondents. The introductory part of the choice experiment for each product had an information treatment (provided to every other respondent) and a cheap talk script, described above as an introductory statement before the start of the interviews to negate the potential influence of hypothetical bias (Annex 2).

Descriptive statistics of selected demographic variables for the survey sample are presented in Table 2. The mean age of consumers was 38 years. Sample shoppers were mainly female. Eleven percent did not go to formal education and the majority have secondary education or less. The majority are self-employed. The majority of the sample shoppers are nonpoor: about 7 to 11 percent are in the poor group (< 400 cedi or USD 83 income per month), 62 to 73 percent are in the middle-income group (400 to 2,000 cedi or USD 83–415 per month), and 8 to 14 percent are in the rich group (> 2,000 cedi or USD 415 per month). The mean weekly food expenditure was 195 to 216 cedi, which was roughly USD 40–50/week or USD 6–7/day.

Table 2. Sociodemographic statistics of sample shoppers

	Chicken	Tilapia
Sample	403	400
Age	38.68 (11.28)	37.8 (11.28)
Gender (%)		
Male	21.84	20.00
Female	78.16	80.00
Highest education (%)		
No formal education	10.92	11.25
Primary	9.43	13.75
Junior secondary education	26.80	30.75
Secondary education	31.02	24.25
Postsecondary	7.94	7.75
Bachelor's degree	11.66	9.50
Master's or higher degree	1.99	2.00
Employment (%)		
Full-time employed	33.25	14.00
Part-time employed	2.98	2.25
Self-employed	55.09	75.50
Unemployed	4.71	3.25
Retired	1.99	2.75
Household duties (homemaker)	0.25	0.75
Student	1.49	1.25
Income group (%)		
GHS < 400	10.67	6.75
GHS 400 to < 1,000	40.69	40.75
GHS 1,000 to < 2,000	31.51	20.75
GHS 2,000 to < 3,000	10.17	3.25
GHS 3,000 to < 4,000	2.98	2.75
GHS 4,000 and above	0.99	1.50
I prefer not to state my income	2.98	24.25
Household size	4.25 (2.49)	4.45 (2.17)
Weekly food expenditure (cedi)	216.20 (133.40)	195.48 (138.05)

Source: IFPRI consumer exit survey (2018).

Note: Figures are the means (averages) and in parentheses are the standard deviations; other figures are specified as percentages of the sample shoppers per product.

To assess the representativeness of the sample of respondents encountered through the consumer exit approach, we compare selected sociodemographic characteristics of the sample to corresponding data from two large nationally representative surveys: the Ghana Living Standards Survey, round 6 (GLSS6 2012/2013) and the Ghana Demographic and Health Survey (DHS 2014). Some variables in the GLSS6 and DHS datasets are also designed to be regionally representative and disaggregated by region, so for some attributes we are able to assess representativeness on the national level, in comparison with urban households alone, for the Greater Accra region and for urban Accra. The comparisons are presented in Annex Table 2 for gender, age, education, marital status, employment, religion, ethnicity, and household size and percentage of children in the population below 18 years (our sample) and 19 years (GLSS and DHS).

The sample statistics for the study respondents are generally representative of Ghana's urban population, with only a few differences in demographic characteristics of the sample of respondents compared with the national, regional, or city population statistics. One notable difference between the sample and the national statistics is that the share of female respondents was 78 percent for the chicken respondents and 80 percent for the tilapia respondents, higher than the national statistic of 52 percent female in the population (Annex Table 2). This reflects the fact that in Ghana shopping for food for the household is predominantly carried out by women. The average age of respondents was in the late 30s, slightly below the mid-40 average age of household heads in the national data, reflecting the relatively younger populations in urban areas. Education levels were generally higher for the sample than pertains at the national level, but the education levels were comparable with the averages for the Greater Accra area. More than half the sample were married in the study sample, compared with around 40 percent in the

GLSS and DHS samples. In terms of employment, around 90 percent of the respondents were employed, either full-time, part-time, or self-employed. The corresponding figure in the national statistics is 70 to 80 percent. Sample attributes such as ethnic background, religion, and number of children were generally comparable with national and regional statistics.

Estimation and willingness to pay

The study's empirical model is based on the choice experiment structure, which contains the four aforementioned attributes. An opt-out variable serves as a constant in our model. The data were effects coded to eliminate confounding effects between the constant and the attributes (Bech and Gyrd-Hansen 2005).

The latent class model specifications were estimated using Stata software. In the latent class model, four classes were identified among chicken and tilapia shoppers as optimal using both the Akaike and Bayesian information criterions and the estimates of the latent class model. The parameter estimates from the latent class model provide little economic information given the noncardinal nature of utility. Consequently, these results are used to obtain a willingness-to-pay measure, which is given by

$$WTP_k = -\frac{\beta_k}{\beta_p},$$

where WTP_k is the willingness to pay for the kth attribute, β_k is the estimated parameter of the kth attribute, and β_p is the estimated price coefficient. There are different willingness to pay estimates for each shopper class. Ninety-five percent confidence intervals for the willingness to pay estimates were created using a parametric bootstrapping technique proposed by Krinsky and Robb (1986). More specifically, a distribution of 1,000 observations for each willingness to pay estimate was simulated by drawing from a multivariate normal distribution parameterized with the coefficient and variance terms obtained from the models. This method produces analogous results to estimating a standard error using the delta method; however, it relaxes the assumption that willingness to pay is symmetrically distributed (Hole 2007).

4. Results

4.1. Consumption patterns of chicken and tilapia

The consumption data for our sample confirm that chicken meat and tilapia are among the most popular sources of animal protein in Ghana. In the sample of shoppers, 60 percent of chicken meat shoppers eat chicken meat at least once per week, 70 percent of tilapia shoppers eat tilapia at least once per week, and 10 percent of our chicken shoppers eat chicken and 8 percent of tilapia shoppers eat tilapia at least once per day (Table 3). Both chicken and tilapia are mainly prepared and eaten at home rather than outside, and this is more pronounced for tilapia where 55 percent of shoppers have never eaten tilapia outside the home. For chicken, larger household size is an important predictor of the frequency of consumption at home, and for both products, youth is the main predictor of regular consumption outside the home. Both findings point to increasing consumption in the future as households assimilate more migrants from rural areas into cities, and as Ghana's population of young people increases.

Table 3. Percentage of consumers consuming chicken and tilapia away from home and at home

	Outside home		At home	
	Chicken	Tilapia	Chicken	Tilapia
At least once a day	5	2	10	8
More than once a week	10	2	19	18
About once a week	9	8	31	44
A few times a month	17	10	15	1
About once a month	11	6	20	14
A few times a year	17	17	5	4
Never	30	55	0	1

Source: IFPRI consumer exit survey (2018).

We also asked questions about the frequency of purchases of chicken meat and tilapia and household expenditure on the two products. The responses corroborate the consumption data. The majority of households purchased chicken quite regularly. Of the surveyed respondents, 32 percent had purchased chicken in the past week, 58 percent had purchased chicken in the past month, but about a quarter had not purchased chicken for more than one month (Table 4).

Table 4. Percentage of households reporting frequency of purchase of chicken and tilapia for home consumption

When was the last time you purchased chicken for the home?	Overall	Income group		
		Poor	Middle	Rich
Less than a week	31.76	39.53	30.93	29.82
More than a week	26.05	27.91	25.09	29.82
Less than one month	17.87	16.28	18.56	17.54
More than one month	24.32	16.28	25.43	22.81
Surveyed consumers	403	43	291	57
When was the last time you purchased tilapia for the home?	**Overall**	**Income group**		
		Poor	**Middle**	**Rich**
Less than a week	64.25	59.26	67.07	60.00
More than a week	16.75	18.52	16.26	20.00
Less than one month	6.25	3.70	6.10	0.00
More than one month	12.75	18.52	10.57	20.00
Surveyed consumers	400	27	246	30

Source: IFPRI consumer exit survey (2018).

Purchasing patterns varied slightly across the income groups. Poor households purchased chicken more frequently than richer households. While 40 percent of poor households had purchased chicken in the past week, 31 percent of middle-income households and 30 percent of richer households had purchased chicken in the past week (Table 4). The difference may reflect a lack of assets for storing meat, such as refrigeration and constant supply of electricity, in the poorer households.

Frequency of tilapia purchase was quite high among all households: 64 percent reported purchasing tilapia in the last week, and the frequency for poor households of 59 percent was comparable with that for richer households at 60 percent (Table 4). About 13 percent of households reported that they had not purchased tilapia for more than one month. Consumers reported spending about twice as much on tilapia (GHS 20.29 per kilogram) compared with chicken (GHS 11.55 per kilogram).

We asked consumers about the country of origin for their chicken purchases in the past three months (Table 5). Nearly 40 percent of consumers did not know the country of origin, although the shops interviewed confirmed that this is imported chicken. A quarter reported purchasing chicken produced in Ghana, while the others reported purchasing imported chicken meat, mainly from European Union countries or Brazil (11 percent each). The questionnaire included a question about the chicken parts purchased (Table 6), which gives some confirmation of the country-of-origin data. About 11 percent and 10 percent respectively purchased chicken dressed on site in the market or at home, which would almost certainly be chicken produced in Ghana. The remainder purchased chicken parts, primarily quarters, thighs, and drumsticks, which are more commonly imported, given the low processing capacity in Ghana (Table 6).

On the other hand, while 66 percent have heard of or known of available imported tilapia in the market, only 13 percent have tried it. The overwhelming majority have been purchasing locally farmed tilapia, and the most commonly purchased size is the regular (200 to 300 grams) and size 1 (300 to 400 grams).

Table 5. Country of origin for chicken bought in the past three months

Country of origin	Percent of sample shoppers
Brazil	11
Europe: EU, Netherlands, Germany, other	11
United States	3
Imported chicken, but don't know the exact country	12
Consumers do not know (but shops indicate it is imported)	39
Ghana	24

Source: IFPRI consumer exit survey (2018).

Table 6. Parts of chicken purchased in the past three months

Chicken parts	Percent of sample shoppers
Leg quarters/thighs	37
Wing quarters/wings	25
Whole chicken, live, dressed on site	11
Whole chicken, live, prepared at home	10
Drumsticks	5
Whole chicken, dressed already	3
Breast fillets	2
Offals	4
Chicken back	1

Source: IFPRI consumer exit survey (2018).

4.2. Perceptions of food safety for chicken and tilapia

We asked respondents for self-reported estimations of health consciousness. Almost all respondents (96 to 99 percent) agreed with the statement "I pay attention to the health implications and safety of food that I eat," with little variability among education or income groups (Table 7). However, the intensity of being health conscious differs in terms of either "strongly agree" or "agree" responses.

The majority of respondents trust the mandated government agencies with the inspection and certification of the safety of their foods. About 86 percent of the respondents agree or strongly agree that the main agencies, the FDA and the GSA, can be trusted to ensure the safety of foods on the market. Again, the intensity of trust differs in terms of either "strongly agree" or "agree" responses: 34 percent of chicken shoppers and 25 percent of tilapia shoppers "strongly agree" with the statement, while the majority (46 percent and 68 percent among chicken and tilapia shoppers respectively) agree (Table 7).

These perceptions vary slightly across education and income groups, with more agreement among the less educated and poorer respondents. Among respondents with a university degree, 18 percent disagreed or strongly disagreed with the assertion, compared with 10 percent for those with a postsecondary degree, 5 percent for those with secondary degrees, and less than 5 percent for those with less than secondary education. Comparing income groups, 10 percent of the richer group reported that they did not trust the agencies to ensure food safety, while fewer than 5 percent in the lower-income groups gave a similar response.

Table 7. Level of food safety consciousness and trust in food certification (% of shoppers)

	Chicken	Tilapia
"I am health conscious. I pay attention to the health implications and safety of foods I eat."		
Strongly disagree	0	1
Disagree	4	0
Agree	34	46
Strongly agree	62	53
"I trust FDA and GSA to ensure safety of foods for consumers."		
Strongly disagree	5	3
Disagree	15	4
Agree	46	68
Strongly agree	34	25

Source: IFPRI consumer exit survey (2018).

In general, there seems to be a more favorable perception on local chicken and tilapia compared with imported products in terms of nutrition, food safety, and taste (Table 8). However, supply or availability of local products in shops seems to be a major issue and this is more pronounced with local-cut chicken.

Table 8. Perception on local and imported chicken and tilapia (% of shoppers)

	Chicken	Tilapia
"Locally produced chicken/tilapia is more nutritious than imported ones."		
Strongly disagree	1	1
Disagree	5	1
Agree	27	34
Strongly agree	67	65
"Locally produced chicken/tilapia is safer than imported ones."		
Strongly disagree	1	1
Disagree	4	1
Agree	33	38
Strongly agree	62	61
"Locally produced chicken/tilapia is tastier than imported ones."		
Strongly disagree	0	1
Disagree	4	1
Agree	26	38
Strongly agree	69	60
"Locally-cut chicken meat / farmed tilapia produced in Ghana is harder to find in shops than imported ones."		
Strongly disagree	1	3
Disagree	4	13
Agree	17	43
Strongly agree	79	41

Source: IFPRI consumer exit survey (2018).

4.3. Consumer demand for chicken meat attributes

In this section we first describe the self-reported attributes that drive chicken meat selection. Second, we analyze the determinants of the food demand attributes for respondents. Third, we categorize respondents into classes according to their strongest preferences and, lastly, we analyze willingness to pay for safety attributes.

In terms of self-reported attributes, across all income groups, freshness of chicken is the most important attribute that shoppers looked for (Table 9). Next are price, size, food safety, and tenderness, and this is consistent across income groups. There are slight differences across income groups. Meat size, tenderness, and packaging are slightly more commonly demanded among the poor than others. Availability is slightly a more important consideration among the lower-middle group than others. Price is a slightly more important consideration among the upper-middle group than others. The rich seem to put less emphasis on freshness and taste, and more emphasis on nutrition and country of origin, compared with other groups. Food safety is a consistently important attribute being considered by at least a third of the shoppers, across income groups (Table 9).

Table 9. Chicken meat attribute demand by income group (% of shoppers)

Attribute	All *N* = 391	Poor *N* = 43	Lower middle *N* = 164	Upper middle *N* = 127	Rich *N* = 57
Freshness	59	60	59	62	47
Price	39	35	36	46	37
Size	38	42	32	44	46
Food safety	36	37	37	35	35
Tenderness	32	44	30	29	28
Color	16	19	16	13	14
Taste	15	14	16	17	7
Availability	11	5	16	9	7
Packaging	9	16	7	6	12
Aroma when cooked	8	2	9	9	9
Country of origin (local product)	7	7	6	5	14
Nutrition	6	5	5	5	14
Processed	1	2	2	1	0

Source: IFPRI consumer exit survey (2018).

In Table 10 we examine the effect of the randomly assigned information treatment about the negative impacts of food-borne illnesses on the attribute demand for chicken meat. As expected, food safety attribute demand is strongly and significantly associated with the negative information treatment, when other relevant factors are held constant. Education level is negatively associated with food safety attribute demand but positively associated with Ghana-produced chicken. Income does not seem to be statistically associated with food safety attribute demand.

Table 10. Results of the probit model on the determinants of attribute demand

	Food safety			Price			Size			Fresh			Local		
	Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.	
Information treatment (= 1)	0.108	0.051	**	-0.055	0.052		0.009	0.207		0.077	0.052		0.035	0.019	*
Trust in FDA (Likert scale, 1–4)	-0.018	0.032		0.011	0.033		-0.081	0.045		-0.013	0.034		-0.022	0.011	**
Health conscious (Likert scale, 1–4)	0.052	0.048		-0.083	0.048	*	-0.042	0.146		0.131	0.048	***	-0.027	0.015	*
Income group (control—rich)															
Poor	0.013	0.104		-0.003	0.104		-0.192	0.217		0.132	0.095		-0.027	0.017	
Lower middle	0.004	0.079		-0.015	0.080		-0.150	0.159		0.129	0.078	*	-0.035	0.022	*
Upper middle	0.002	0.079		0.085	0.081		-0.154	0.157		0.135	0.077	*	-0.045	0.020	**
Age	0.003	0.002		-0.001	0.002		-0.001	0.008		-0.002	0.003		-0.001	0.001	
Male (= 1)	-0.009	0.067		0.041	0.068		-0.141	0.124		-0.122	0.069	*	-0.022	0.016	
Household size	0.003	0.010		0.019	0.010	*	-0.017	0.024		0.002	0.011		-0.006	0.005	
Education level	-0.032	0.019	*	0.024	0.019		-0.069	0.006		-0.021	0.020		0.017	0.006	***
Frequency of eating home	0.008	0.020		0.019	0.020		-0.030	0.047		-0.039	0.020	*	-0.004	0.007	
Frequency of eating outside	0.017	0.014		-0.019	0.014		-0.010	0.045		0.014	0.015		0.006	0.005	
Pseudo R2		***0.08***			***0.06***			***0.04***			***0.08***			***0.18***	

Source: IFPRI consumer exit survey (2018).
Note: FDA = Food and Drugs Authority.
***, **, * significant at 1%, 5%, and 10% level respectively.

In the third step of our analysis of chicken meat demand, we categorize the respondents according to their primary preferences for chicken meat attributes. Based on indirect utilities modeling for different attributes (Table 11 and Table 12), we can define four distinct types of chicken meat shoppers based on lowest Akaike information criterion (AIC) and Bayesian information criterion (BIC):

- Class 1 comprises consumers with strong preference for local chicken, regardless of the price (32 percent of the shoppers). They have preference on the food safety and freshness of the chicken, but to a lesser degree. There are slightly more rich households in this class than in other classes (Table 12).
- Class 2 consists of those with strong preference for chicken certified as safe, especially chicken free of antibiotic residue (50 percent of the shoppers). The upper-middle-income and richer households represent the largest proportion share of this class compared to other classes.
- Class 3 is made up of those with strong preference for imported chicken (8 percent of the shoppers). Among poor households, the largest share is in this class.
- Class 4 consists of those who are price conscious (10 percent of the shoppers). The income group with the largest share in this class is the lower-middle-income group.

Table 11. Results of the latent class model, *N* = 9,672

	Class 1 Lovers of local chicken			Class 2 Food safety conscious			Class 3 Lovers of imported chicken			Class 4 Price conscious		
	Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.	
Ghana-produced	3.641	0.357	***	1.194	0.247	***	-1.370	0.418	***	0.505	0.563	
HACCP-certified	0.420	0.163	**	2.682	0.153	***	0.961	0.204	***	-0.064	0.225	
Certified as antibiotic residue free	1.218	0.189	***	3.651	0.209	***	0.370	0.237		0.832	0.230	***
Fresh	0.685	0.284	**	0.359	0.242		0.335	0.413		0.144	0.584	
Price	0.380	0.257		0.036	0.191		0.525	0.361		-5.815	0.655	***
Opt out	1.066	0.237	***	0.370	0.243		-1.834	0.316	***	-20.265	0.361	***
	Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.	
Ghana-produced	0.276	0.122	**	0.143	0.035	***	-0.242	0.086	**	0.000	0.001	
HACCP-certified	0.032	0.018	*	0.320	0.047	***	0.169	0.039	***	0.000	0.000	
Certified as antibiotic residue free	0.092	0.048	*	0.436	0.073	***	0.065	0.047		0.001	0.000	***
Fresh	0.052	0.032		0.043	0.029		0.059	0.074		0.000	0.001	
Price	0.029	0.008	**	0.004	0.022		0.093	0.050	*	-0.006	0.001	***
Opt out	0.081	0.035	**	0.044	0.027	*	0.323	0.073	***	-0.020	0.000	***

Source: IFPRI consumer exit survey (2018).
Note: HACCP = Hazard Analysis and Critical Control Point.
***, **, * significant at 1%, 5%, and 10% level respectively.

Table 12. Relative utilities from different attributes by shopper class

	Class 1 Lovers of local chicken	Class 2 Food safety conscious	Class 3 Lovers of imported chicken	Class 4 Price conscious
Attribute importance (%)				
Ghana-grown	54.0	15.2	36.3	4.9
HACCP-certified	9.0	34.1	27.4	0.1
Certified antibiotic residue free	20.9	45.8	16.1	9.8
Fresh	11.1	4.4	10.5	4.2
Price	5.0	0.5	9.8	81.1
Part-worth utilities				
Ghana-grown	1.7	0.6	-0.6	0.2
HACCP-certified	0.3	1.3	0.5	-0.0
Certified antibiotic residue free	0.7	1.8	0.3	0.4
Fresh	0.3	0.2	0.2	0.2
Price	0.1	0.0	0.1	-1.2
Opt out	-2.0	-3.7	-2.1	-27.9
Part-worth utilities (rescaled)				
Ghana-grown	135.1	38.0	-90.8	12.2
HACCP-certified	22.5	85.4	68.4	-0.1
Certified antibiotic residue free	52.2	114.4	40.1	24.4
Fresh	27.6	10.9	26.2	10.5
Price	5.0	0.5	9.8	-81.1
Opt out	-162.6	-237.5	-303.1	-1932.9
Class size (%)	32	50	8	10
Income grouping (%)				
Poor	12	9	**21**	10
Lower middle	46	36	46	**55**
Upper middle	25	**40**	21	24
Rich	**17**	**15**	11	12

Source: IFPRI consumer exit survey (2018).
Note: HACCP = Hazard Analysis and Critical Control Point.

Although the classes are defined by consumers' strong preferences for particular attributes, their demand for other attributes provides helpful information on the overlap between product characteristics and the attributes. For example, it is interesting to note the importance of freshness, from respondents' perspective, across all the four classes (Table 13). Among the price-conscious shoppers, while 57 reported price as the attribute they look out for, 55 reported looking out for freshness. Similarly, even for those who strongly prefer imported chicken, 67 reported that they look out for freshness, a characteristic not usually associated with frozen imports (Table 13).

Table 13. Attribute demand by shopper class (% of shoppers)

	All	Class 1 Lovers of local chicken	Class 2 Food safety conscious	Class 3 Lovers of imported chicken	Class 4 Price conscious
Freshness	59	61	57	67	55
Price	39	28	43	27	57
Size	38	36	41	27	38
Food safety	36	38	35	53	26
Tenderness	32	34	31	33	29
Color	16	21	12	20	17
Taste	15	13	17	13	12
Availability	11	8	13	13	12
Packaging	9	10	8	10	12
Aroma when cooked	8	6	11	3	2
Country of origin (local product)	7	7	8	7	2
Nutrition	6	7	7	3	7
Processed	1	1	2	3	0

Source: IFPRI consumer exit survey (2018).

We now turn to the determinants of the likelihood of belonging to any one of the four classes of shoppers defined above. We use a probit model for this analysis, with a dependent variable taking on a value of one if the respondent belongs to the class and zero otherwise. Results are presented in Table 14. Information treatment and trust in the FDA or GSA are not statistically significant in belonging to Class 2 (food safety conscious) (Table 14). Income also is not a significant indicator of belonging to any shopper class. Respondents with higher education are less likely to be in the class with a strong preference for imported chicken, and those who eat outside the home more often are more likely to have a strong preference for local chicken meat.

Table 14. Results of the probit model on the determinants of belonging to each shopper class.

	Class 1 Lovers of local chicken			Class 2 Food safety conscious			Class 3 Lovers of imported chicken			Class 4 Price conscious		
	Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.		Marginal effect	Std. Err.	
Information treatment (= 1)	0.024	0.048		-0.015	0.054		0.029	0.024		-0.037	0.030	
Trust in FDA (Likert scale, 1–4)	-0.002	0.030		0.023	0.034		-0.006	0.015		-0.014	0.019	
Health conscious (Likert scale, 1–4)	0.022	0.044		-0.034	0.050		0.027	0.023		-0.013	0.026	
Income group (control = rich)												
Poor	-0.042	0.089		-0.043	0.108		0.067	0.072		0.012	0.065	
Lower middle	-0.015	0.072		-0.037	0.082		0.003	0.038		0.043	0.050	
Upper middle	-0.100	0.068		0.112	0.081		-0.012	0.037		-0.002	0.048	
Age	-0.001	0.002		-0.001	0.003		-0.001	0.001		0.003	0.001	*
Male (= 1)	0.018	0.063		-0.130	0.070	*	0.002	0.032		0.111	0.054	**
Household size	-0.017	0.010	*	0.013	0.011		-0.002	0.005		0.004	0.006	
Education level	0.000	0.018		0.033	0.020	*	-0.019	0.009	***	-0.011	0.011	
Frequency of eating home	0.017	0.018		-0.038	0.021	*	-0.005	0.009		0.021	0.011	*
Frequency of eating outside	0.043	0.014	***	-0.024	0.015	*	0.002	0.007		-0.017	0.008	**

Source: IFPRI consumer exit survey (2018).
Note: FDA = Food and Drugs Authority.
***, **, * significant at 1%, 5%, and 10% level respectively.

Our final analytical piece on chicken meat demand estimates willingness to pay for various attributes, with a focus on the food safety attributes. Shoppers across all classes are willing to pay positive premiums for chicken meat certified with a food safety management system (Table 15). Class 2 (food safety conscious) shoppers will pay the highest premium (10.66 percent) for HACCP-certified chicken meat, and will pay a 15.67 percent premium for chicken certified as antibiotic residue free versus noncertified chicken meat. The lowest price premium is found among Class 3 (imported chicken lovers) and Class 4 (price conscious) shoppers, wherein shoppers are willing to pay less than 1 percent (0.08–0.14 percent) more for HACCP-certified chicken meat than noncertified chicken meat and 0.15–0.46 percent more for chicken meat certified as antibiotic residue free.

Table 15. Willingness to pay for chicken meat attributes (%)

	Class 1 Local product lovers	Class 2 Food safety conscious	Class 3 Imported chicken lovers	Class 4 Price conscious
Ghana-produced	14.07	9.85	4.42	0.34
	[7.87–20.27]	[7.41–12.29]	[2.69–6.15]	[0.30–0.38]
HACCP-certified	3.31	10.66	0.08	0.14
	[2.19–4.42]	[8.12–13.21]	[0.78–0.93]	[0.10–0.18]
Certified antibiotic residue free	7.03	15.67	0.15	0.46
	[4.63–9.43]	[12.33–19.01]	[-1.24–0.94]	[0.42–0.48]
Fresh	5.97	3.00	1.46	0.20
	[3.67–8.27]	[2.26–3.74]	[0.86–2.06]	[0.18–0.22]

Source: IFPRI consumer exit survey (2018).
Note: Figures in brackets are the 95% confidence interval estimates. HACCP = Hazard Analysis and Critical Control Point.

4.4. Consumer demand for tilapia

In terms of stated demand for attributes, freshness is the overwhelmingly preferred attribute for tilapia across shopper classes and income groups (Table 16). There is strong preference for fresh tilapia. The second most preferred attribute is tilapia size, then price, and then taste and food safety. However, there are some differences across tilapia shoppers according to income. Among the poor, price is the second most important attribute, followed by size and food safety. Among the lower-middle-income group, size and price are second most important, followed by taste and food safety. Among the upper-middle-income group, size, price, and taste are second most important. Among the rich, size and food safety are second most important. Nonetheless, food safety is considered among the most important attributes of tilapia (third commonly demanded among the rich, fourth commonly demanded among the poor, and fifth commonly demanded among the middle-income group).

Table 16. Tilapia attribute demand by income group (% of shoppers)

Attribute	All	Poor	Lower middle	Upper middle	Rich
Freshness	93	96	92	99	93
Size	53	41	50	45	57
Price	42	59	48	41	20
Taste	22	15	23	37	23
Food safety	20	30	20	19	30
Firmness	17	22	18	18	20
Availability	15	11	14	12	23
Country of origin (locally grown)	12	0	12	16	17
Color	11	11	13	5	13

Source: IFPRI consumer exit survey (2018).

Food safety attribute demand is positively associated with health and food safety consciousness of the shopper, negatively associated with past experience with imported tilapia, and positively associated with household size (Table 17). Income does not seem to be a strong determinant of food safety attribute demand. Demand for lower price is associated with lower income, lower health and food safety consciousness, and lower education among shoppers. Male shoppers seem to value tilapia size more than female shoppers do, while female shoppers seem to value freshness more than males do. In contrast to chicken meat, the negative information treatment was not a statistically significant determinant of food safety attribute demand for tilapia (Table 17). The level of trust in the FDA or GSA was also not a statistically significant determinant of food safety attribute demand.

Table 17. Results of probit model on the determinants of tilapia attribute demand

	Safety			Price			Size			Fresh			Local		
	Marginal effect	**Std. Err.**		**Marginal effect**	**Std. Err.**		**Marginal effect**	**Std. Err.**		**Marginal effect**	**Std. Err.**		**Marginal effect**	**Std. Err.**	
Information treatment (= 1)	0.036	0.054		-0.012	0.077		0.065	0.076		-0.011	0.017		-0.037	0.028	
Trust in FDA (Likert scale, 1–4)	0.061	0.043		-0.077	0.064		-0.059	0.062		0.003	0.011		-0.025	0.019	
Health conscious (Likert scale, 1–4)	0.145	0.051	***	-0.186	0.071	***	-0.217	0.067	***	-0.046	0.023	**	0.033	0.028	
Income group															
Poor	-0.022	0.126		0.443	0.111	**	0.021	0.190		0.011	0.022				
Lower middle	0.051	0.088		0.378	0.138	**	-0.046	0.136		0.001	0.024		0.775	0.178	***
Upper middle	0.028	0.100		0.325	0.141	**	-0.040	0.139		0.014	0.022		0.994	0.017	***
Rich													0.989	0.008	***
Male (= 1)	0.104	0.076		-0.029	0.092		0.210	0.086	**	-0.074	0.046	**	0.021	0.034	
Previous experience of imported tilapia (= 1)	-0.298	0.090	***	0.068	0.095		0.039	0.093		0.034	0.027		-0.073	0.043	*
Education (Likert scale)	0.025	0.022		-0.053	0.033	*	-0.032	0.032		0.007	0.008		0.005	0.011	
Married (= 1)	-0.031	0.060		-0.085	0.082		0.000	0.081		0.006	0.019		0.024	0.025	
Household size	0.024	0.013	*	0.013	0.018		-0.012	0.017		0.007	0.005		-0.002	0.006	
Frequency of eating home	0.027	0.020		0.013	0.030		-0.001	0.030		-0.003	0.005		-0.014	0.010	
Frequency of eating outside	-0.017	0.017		-0.002	0.023		-0.031	0.024		0.002	0.005		0.006	0.008	
Pseudo R2		***0.18***			***0.12***			***0.10***			***0.25***			***0.12***	

Source: IFPRI consumer exit survey (2018).
Note: FDA = Food and Drugs Authority.
***, **, * significant at 1%, 5%, and 10% level respectively.

Based on the latent class model, we identify four distinct types of tilapia consumers based on AIC and BIC: price conscious (Class 1, 9 percent of the sample shoppers), food safety conscious (Class 2, 35 percent), local tilapia lovers (Class 3, 40 percent), and fresh tilapia lovers (Class 4, 16 percent) (Tables 18 and 19). Shoppers from all income groups belong to each of these classes, although slightly higher proportions of the poor and lower-middle-income groups belong to Class 1, and greater percentages of upper-middle-income and rich groups belong to Classes 2 and 4 (Table 19).

Among the price conscious, price and size are preferred almost as much as freshness and no one has preference regarding the food safety attribute (Table 20). The other shopper classes demonstrate some preference for food safety. Fresh tilapia lovers have a strong preference regarding tilapia taste. Price conscious shoppers and local tilapia lovers have stronger preference regarding price than other shoppers; while food-safety conscious and fresh tilapia lovers have stronger preferences regarding food safety and localness (country of origin).

The level of food safety and health consciousness is associated with increased probability of belonging to Class 4 (fresh tilapia lovers) (Table 21). The level of education is associated with an increased probability of belonging to Class 2 (food safety conscious) and a reduced probability of belonging to Class 3 (local tilapia lovers). Past experience with imported tilapia and frequency of eating tilapia at home increases the probability of belonging to Class 1 (price conscious).

Shoppers across all classes are willing to pay positive premiums for tilapia certified with a food safety management system (Table 22). Price conscious shoppers have the lowest willingness to pay for food safety. They are willing to pay less than 1 percent (0.21 percent for HACCP-certified tilapia and 0.13 percent for tilapia certified as antibiotic residue free) more than for noncertified product. Class 2 (food safety conscious) shoppers have the highest price premium and they are willing to pay for improved food safety: 12.24 percent higher for HACCP certified tilapia and 12.64 percent higher for tilapia certified as antibiotic residue free than noncertified tilapia.

Table 18. Results of the latent class model, *N* = 9,600

	Class 1 Price conscious			Class 2 Food safety conscious			Class 3 Local tilapia lovers			Class 4 Fresh tilapia lovers, not price sensitive		
	Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.	
Ghana-grown	0.517	0.440		1.537	0.239	***	4.569	0.249	***	1.999	1.462	
HACCP-certified	0.779	0.219	***	1.955	0.125	***	0.759	0.152	***	0.687	0.365	*
Certified antibiotic residue free	0.446	0.228	*	1.993	0.117	***	0.643	0.165	***	1.871	0.563	***
Fresh	0.868	0.434	**	0.121	0.238		0.627	0.195	***	6.792	1.239	***
Price (cedi/kg)	-0.255	0.023	***	-0.007	0.011		-0.057	0.014	***	0.065	0.038	*
Opt out	-21.543	0.412	***	-2.195	0.445	***	1.035	0.324	***	7.209	1.095	***
	Marginal effects	Std. Err.		Marginal effects	Std. Err.		Marginal effects	Std. Err.		Marginal effects	Std. Err.	
Ghana-grown	0.029	0.026		0.135	0.025	***	0.641	0.041	***	0.068	0.055	
HACCP-certified	0.044	0.015	***	0.175	0.021	***	0.090	0.023	***	0.063	0.030	**
Certified antibiotic residue free	0.025	0.014	*	0.172	0.021	***	0.107	0.019	***	0.023	0.010	**
Fresh	0.049	0.027	*	0.011	0.021		0.088	0.028	***	0.229	0.083	***
Price (cedi/kg)	-0.140	0.020	***	-0.010	0.010		-0.080	0.020	***	0.020	0.007	***
Opt out	-1.208	0.201	***	-0.193	0.023	***	0.145	0.035	***	0.243	0.070	***

Source: IFPRI consumer exit survey (2018).
Note: HACCP = Hazard Analysis and Critical Control Point.
***, **, * significant at 1%, 5%, and 10% level respectively.

Table 19. Relative utilities from tilapia attributes by shopper class.

	Class 1 Price conscious	Class 2 Food safety conscious	Class 3 Ghana-grown tilapia lovers	Class 4 Fresh tilapia lovers, not price sensitive
Part-worth utilities				
Ghana-grown	0.521	0.770	9.139	1.587
HACCP-certified	0.427	1.014	0.407	0.569
Certified antibiotic residue free	0.470	1.074	0.379	0.780
Fresh	0.379	-0.020	0.038	2.902
Price	-1.250	-0.032	-0.385	0.060
Opt out	-42.660	-4.463	-7.179	-0.856
Part-worth utilities (rescaled)				
Ghana-grown	26.472	65.094	209.154	66.250
HACCP-certified	21.692	85.682	9.311	23.768
Certified antibiotic residue free	23.857	90.774	8.669	32.555
Fresh	19.240	-1.729	0.864	121.143
Price	-63.496	-2.688	-8.801	2.514
Opt out	-2167.539	-377.279	-164.279	-35.720
Attribute importance (%)				
Ghana-grown	10.589	26.038	83.662	26.500
HACCP-certified	8.677	34.273	3.724	9.507
Certified antibiotic residue free	9.543	36.310	3.468	13.022
Fresh	7.696	0.692	0.346	48.457
Price	63.496	2.688	8.801	2.514
Class size (%)	9	35	40	16
Income group (%)				
Poor	**22**	7	8	10
Lower middle	**61**	52	**58**	41
Upper middle	9	**26**	**29**	**37**
Rich	9	**14**	6	**12**

Source: IFPRI consumer exit survey (2018).
Note: HACCP = Hazard Analysis and Critical Control Point.

Table 20. Attribute demand by shopper class (% of shoppers)

	All	Class 1 Price conscious	Class 2 Food safety conscious	Class 3 Ghana-grown tilapia lovers	Class 4 Fresh tilapia lovers, not price sensitive
Freshness	93	88	94	92	94
Size	53	67	62	51	23
Price	42	73	28	52	25
Taste	22	6	13	24	52
Food safety	20	0	26	16	29
Firmness	17	21	10	20	25
Availability	15	6	21	12	10
Country of origin (Ghana-grown)	12	6	16	8	19
Color	11	12	12	9	13

Source: IFPRI consumer exit survey (2018).

Table 21. Results of the probit model on the determinants of belonging to each shopper class.

	Class 1 Price conscious			Class 2 Food safety conscious			Class 3 Local tilapia lovers			Class 4 Fresh tilapia lovers		
	Marginal effects	**Std. Err.**		**Marginal effects**	**Std. Err.**		**Marginal effects**	**Std. Err.**		**Marginal effects**	**Std. Err.**	
Information treatment (= 1)	-0.034	0.033		0.047	0.069		-0.050	0.075		0.034	0.042	
Trust in FDA (Likert scale, 1–4)	-0.001	0.025		-0.003	0.057		0.013	0.063		-0.013	0.035	
Health conscious (Likert scale, 1–4)	-0.039	0.025		0.037	0.065		-0.093	0.068		0.126	0.045	***
Income group (control = rich)												
Poor	0.208	0.218		-0.026	0.174		-0.021	0.191		-0.091	0.042	
Lower middle	0.018	0.060		0.020	0.122		0.112	0.134		-0.101	0.080	
Upper middle	-0.018	0.059		0.023	0.127		0.123	0.139		-0.087	0.052	
Male (= 1)	-0.013	0.037		0.090	0.085		0.050	0.090		-0.093	0.039	*
Previous experience with imported tilapia (= 1)	0.064	0.032	**	-0.004	0.085		-0.051	0.091		-0.044	0.060	
Education (Likert scale)	-0.010	0.013		0.065	0.029	**	-0.073	0.032	**	0.010	0.019	
Married (= 1)	-0.026	0.034		-0.069	0.075		0.117	0.078		-0.006	0.047	
Household size	0.002	0.007		-0.004	0.017		0.015	0.017		-0.010	0.010	
Frequency of eating home	0.022	0.012	*	0.003	0.026		0.029	0.029		-0.055	0.018	***
Frequency of eating outside	0.006	0.010		-0.008	0.021		-0.018	0.022		0.018	0.015	
Pseudo R2	*0.180*			*0.070*			*0.07*			*0.16*		

Source: IFPRI consumer exit survey (2018).
Note: FDA = Food and Drugs Authority.
***, **, * significant at 1%, 5%, and 10% level respectively.

Table 22. Willingness to pay for tilapia attributes (%)

	Class 1 Price conscious	Class 2 Food safety conscious	Class 3 Local tilapia lovers	Class 4 Fresh tilapia lovers
Ghana-grown	0.142	9.628	4.739	2.322
	[0.127-0.168]	[8.821-10.431]	[3.921-5.354]	[1.821-2.934]
HACCP-certified	0.212	12.244	0.784	0.802
	[0.197-0.232]	[7.510-18.284]	[0.623-0.856]	[0.723-0.886]
Certified antibiotic residue free	0.130	12.643	0.727	2.207
	[0.111-0.153]	[8.430-17.223]	[0.667-0.843]	[1.721-2.776]
Fresh	0.224	0.758	0.661	7.943
	[0.213-0.245]	[0.645-0.843]	[0.615-0.793]	[6.821-9.031]

Source: IFPRI consumer exit survey (2018).
Note: HACCP = Hazard Analysis and Critical Control Point. Figures in brackets are the 95% confidence interval estimates.

5. Discussion and Conclusion

Consumers and policymakers are likely to become more aware of and more concerned about the safety of food in the future. Trends that point in this direction include the increasing consumption of food products such as meats and vegetables that are more prone to disease than cereals, longer and more complex food value chains that provide ample opportunities for contamination, and growing disconnectedness between food producers and consumers, which may exacerbate the information asymmetries that often increase food safety concerns. Public policies and investments to provide greater awareness of and information on food safety can be successful only if researchers and decision makers have adequate information about the extent to which consumers value food safety and the likely success or not of programs such as public information campaigns. A recent study shows that food safety is correlated with higher prices for maize in Kenya (Hoffmann and Moser 2017), suggesting a potential for branded products that are differentiated by their improved safety attributes. This study contributes to the emerging body of knowledge on this topic in the context of chicken meat and tilapia markets for urban consumers in Accra, Ghana.

The data, gathered from 803 shoppers (403 chicken meat shoppers and 400 tilapia shoppers), which are a representative sample of urban shoppers at diverse locations in Accra, confirm the growing importance of chicken meat and tilapia in Ghanaian diets. Consumption of both products is frequent, with the majority of respondents consuming the products at least once a week, either at home or away from home. Our study provides new information on attribute demand for the products. We find that for both chicken meat and tilapia, freshness is the overwhelmingly most important attribute among shoppers. Food safety is also consistently reported by chicken meat and tilapia shoppers as among the top attributes they look for, along with price and size (that is, bigger size is more desirable). Tenderness is also important for chicken shoppers, and taste is important for tilapia shoppers.

Demand for food safety does not seem to be affected by level of income: poor, middle-income, and rich households all report a strong preference and demand for food safety. This is a potentially significant finding because, as pointed out by Hoffmann and Moser (2017), market segmentation could create incentives for firms to improve food safety for only a segment of consumers. In this case, we find that food safety informational attributes strongly matter to most consumers. Food safety certification systems to signal food safety and extract price premiums can therefore be a strategy for private firms producing chicken meat and tilapia in Ghana. This study presents an opportunity for producers and processors to differentiate their product and grow their market share. The findings suggest that producers and processors could improve their market potential by obtaining GMP, HACCP, or antibiotic-residue-free verifications of their meat or aquaculture products.

The majority of consumers care about food safety and would be willing to pay positive price premiums for it. While freshness and price are the main attributes of focus among a group of respondents, the majority of consumers have high willingness to pay for HACCP and antibiotic-residue-free certification systems. Higher price premiums are associated more with antibiotic-residue-free certification than HACCP certification likely because of the much stronger awareness and concern about antibiotic misuse in poultry production (even if the latter encompasses a broader range of food contamination sources and their control). Similarly, willingness to pay for these certifications is much higher for chicken meat than for tilapia, likely due to more media awareness campaigns on antibiotic misuse and antimicrobial resistance in chicken meat than in tilapia. This may also likely be due to the recent *Listeria* outbreak in poultry meat in South Africa that has been reported in the media in Accra. Studies cited by this paper emphasize the lack of education among producers and the lack of veterinarians available to provide extension services and to help monitor and regulate as the main reasons for the overuse and misuse of antibiotics. This study indicates strong food safety concerns and warrants greater investments for antibiotic use control and for adoption of good management and biosafety practices in production, processing, and food handling.

Although Ghanaian consumers are in general concerned about food safety, they are heterogeneous in that their willingness to pay a price premium to cover the cost of providing safety attributes varies considerably depending on shopper class. Price conscious shoppers have positive but low price premiums (< 1 percent higher for certified chicken or tilapia than noncertified products); however, they are the smallest group (only 9 to 10 percent of shoppers). On the contrary, food safety conscious shoppers, which are the largest group (35 percent among tilapia shoppers and 50 percent among chicken shoppers), have high price premiums for food safety certification amounting to at least 10 to 12 percent higher for HACCP certification and 12 to 15 percent for chicken or tilapia certified as antibiotic residue free than noncertified products.

As Ghanaian urban per capita income and education continues to increase, more people will join this consumer class, become more aware and conscious about food safety and health issues, and therefore they will be willing to pay a higher price for better food safety information from credible certification systems. This should give the government and private sector confidence and an incentive to invest in quality control services for food safety. For the private sector, our findings suggest an additional factor to consider. Food safety certification and labelling is usually done at the processing stage in the food value chain, and improving certification for primary products, such as chicken meat and tilapia, will entail some changes in farm level production management and governance (Grunert 2005). In the Ghanaian context, this could include, for example, contracts among groups of tilapia farmers to voluntarily enforce reduced use of anti-biotics in exchange for certification.

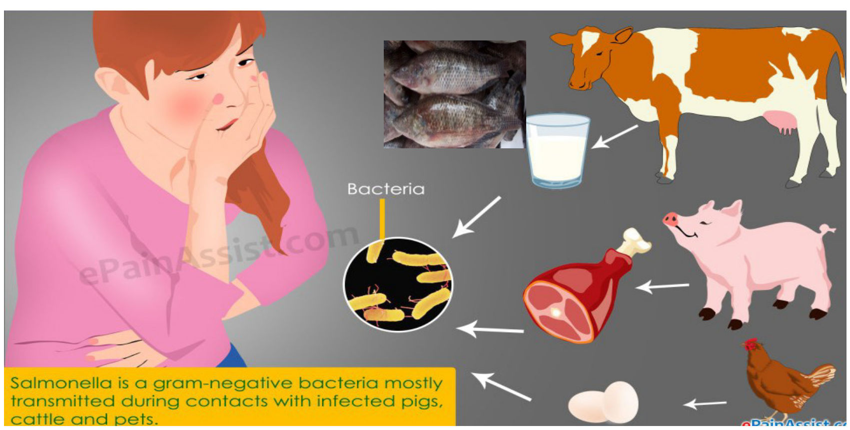
Regarding the information treatment, we found a significant effect on the stated choices among chicken meat shoppers but surprisingly no effect on the stated choices by tilapia shoppers. This may be an indication that consumers may have heard more about food contamination events in the chicken meat industry than in the tilapia industry that they could relate to. The information treatment on the serious public health implications of contaminated foods positively affected the demand and willingness to pay for food safety for chicken. This suggests that public policy or industry efforts in consumer education, including emphasis on the risks and negative health consequences of contaminated foods, can be further intensified at least for chicken meat.

This study indicates that in Ghana, and perhaps across sub-Saharan Africa, urban consumers have food safety concerns that warrant a need for stronger government regulation and oversight, industry cooperation, and enhanced consumer awareness. This study also suggests that there is a potential role for public policy and programs to reduce information asymmetry on food safety, especially for chicken meat. Lastly, the potential producer and processor benefits, indicated by the high willingness to pay for food safety, provide industry groups incentives for adopting voluntary certifications such as the ones being considered for scaling up by Ghana’s food safety regulators.

Annex 1. Details of the information treatment

Information treatment (read to every other respondent)
The chicken you buy and eat may be contaminated with harmful bacteria or chemicals. Contaminated food causes mild or severe cases of diarrhea, typhoid fever, cholera, vomiting, and stomach upset and may even lead to death. The most recent food-borne disease outbreak due to contaminated poultry meat in South Africa resulted in the death of 180 people. According to World Health Organization, around the world . . .

Many studies by University of Ghana found high contamination of disease-causing bacteria in poultry meat, egg, fish, vegetables in various markets in Accra. Overuse and misuse of antibiotics in chicken and farmed tilapia is also a serious issue and can also lead to resistance to antibiotics in animals and humans, and linked to allergic reactions and causing cancer if in large amounts. There are over 625,000 reported cases of food-borne illness reported annually and an estimated 90,000 deaths in Ghana.



The Ghana Standards Authority and Food and Drugs Authority have programs to ensure safe food for consumers. They check, inspect and certify food businesses on Good Manufacturing Practices and Good Hygienic Practices. Hazard Analysis and Critical Control Points (or HACCP in short) have been implemented to identify contamination hotspots and control for the risk of contamination at any point in the food production process. Once you see these logos, these [mean] the product underwent checking and certification from GSA or FDA.

Information treatment 2 (read to every second respondent)
The chicken meat you buy and eat may be contaminated with harmful bacteria or chemicals. The Ghana Standards Authority and Food and Drugs Authority have programs to ensure safe food for consumers. They check, inspect and certify food businesses on Good Manufacturing Practices and Good Hygienic Practices. Hazard Analysis and Critical Control Points (or HACCP in short) have been implemented to identify contamination hotspots and control for the risk of contamination at any point in the food production process. Once you see these logos or symbols, these [mean] the product underwent checking and certification from GSA or FDA.

Annex Table 1. Total number of interviewed shoppers from each type of market

Market type	Tilapia	Chicken
Open-air markets		
Medina market	81	52
Nima market		51
Kaneshie market		50
Lapaz new market		50
Nungua market		50
Lapaz	20	
Weija	34	
Subtotal	**135**	**253**
Supermarkets		
Shop n Save supermarket (Medina)	18	30
Citydia supermarket (La)		20
Shop n Save (Ajiringanor)	2	
Baatsona	2	
Subtotal	**22**	**50**
Live-bird markets		
Medina market		25
Nima market		24
Kaneshie market		25
Spintex Road, Accra		25
Subtotal		**99**
Tilapia markets		
Galilea market	84	
Kaneshie	12	
Subtotal	**96**	
Modern tilapia outlets		
Volta catch	101	
Lake fresh tilapia	20	
Mobile vans	27	
Subtotal	**148**	
Grand total	**401**	**402**

Annex 2. Cheap talk script

We are going to ask you a few questions about whether you would purchase local or imported tilapia at a particular price level. This purchase is hypothetical, that is, you do not actually pay money when you indicate a particular preference. The experience from previous surveys is that people often respond in one way but act differently. It is common that one states a higher willingness to pay than what one actually is willing to pay for the good in the store. In order to avoid this situation, we ask you to respond to each of the following purchase questions just exactly as you would if you were really in a shop and were going to face the consequences of your decision—which is to pay money if you decide to buy a food product within your budget constraint. There are no right or wrong answers, and your honest responses will be very useful for farmers and businesses in producing and developing new safe food products that can satisfy consumer preferences at reasonable prices.

Annex Table 2. Sociodemographic characteristics of sample respondents compared with national-, regional-, and city-level data

Variable	Study samples		GLSS6 (2012/2013)				DHS (2014)		
	Chicken	Tilapia	National (GLSS6)	Urban (GLSS6)	Greater Accra Region (GLSS6)	Urban Accra	National	Urban	Greater Accra
Gender (% male)	21.84	20.0	48.2	n.a.	n.a.	48.3	47.9	47.0	n.a.
Average age (years)	37.68 (of respondents)	37.80 (of respondents)	45.1 (of household heads)	44.2 (of household heads)	n.a.	43.5 (of household heads)	n.a.	n.a.	n.a.
Level of education (compare to GLSS levels):									
Never been to school	10.92	11.25	19.7	14.8	9.1	n.a.	n.a.	n.a.	n.a.
Less than BECE	9.43	13.75	44.6			n.a.	n.a.	n.a.	n.a.
BECE/Vocational	26.80	30.75	20.9	36.9	37.5	n.a.	n.a.	n.a.	n.a.
SHS and higher	52.61	43.50	14.7	28.6	36.7	n.a.	n.a.	n.a.	n.a.
Level of education (DHS levels, female only):									
No education	13.02	13.75	n.a.	n.a.	n.a.	n.a.	n.a.	11.0	8.3
Some primary			n.a.	n.a.	n.a.	n.a.	12.6	9.9	10.5
Completed primary	40.32	48.44	n.a.	n.a.	n.a.	n.a.	5.2	4.0	3.7
Some secondary			n.a.	n.a.	n.a.	n.a.	45.8	49.8	46.3
Completed secondary	31.43	22.50	n.a.	n.a.	n.a.	n.a.	11.0	15.7	17.5
More than secondary	14.92	15.00	n.a.	n.a.	n.a.	n.a.	6.3	9.7	13.7
Level of education (DHS levels, male):									
No education	3.41	1.25	n.a.	n.a.	n.a.	n.a.	10.7	4.1	
Some primary			n.a.	n.a.	n.a.	n.a.	9.6	6.8	
Completed primary	21.59	28.75	n.a.	n.a.	n.a.	n.a.	3.8	2.1	
Some secondary			n.a.	n.a.	n.a.	n.a.	50.6	51.5	
Completed secondary	29.55	31.25	n.a.	n.a.	n.a.	n.a.	13.4	19.2	
More than secondary	45.46	36.25	n.a.	n.a.	n.a.	n.a.	11.8	16.4	
Marital status (GLSS):									
Married	53.85	59.25	39.4	38		36.6	n.a.	n.a.	n.a.
Separated	5.46	6.00	2.2	2.2		3.0	n.a.	n.a.	n.a.
Divorced			3.4	3.9		3.6	n.a.	n.a.	n.a.
Widowed	4.96	3.25	5.6	5.7		4.5	n.a.	n.a.	n.a.
Never married	31.76	30.25	42.3	44.4		46.1	n.a.	n.a.	n.a.
Marital status (DHS, female 15–49):									
Married	55.56	58.13	n.a.	n.a.	n.a.	n.a.	42.2	n.a.	n.a.
Separated	6.98	11.56	n.a.	n.a.	n.a.	n.a.	4.8	n.a.	n.a.
Divorced			n.a.	n.a.	n.a.	n.a.	3.0	n.a.	n.a.
Widowed	6.35	4.06	n.a.	n.a.	n.a.	n.a.	2.7	n.a.	n.a.
Never married	28.57	29.38	n.a.	n.a.	n.a.	n.a.	32.9	n.a.	n.a.
Marital status (DHS, male 15–49):									
Married	47.73	63.75	n.a.	n.a.	n.a.	n.a.	38.3	n.a.	n.a.
Separated	0	0	n.a.	n.a.	n.a.	n.a.	2.1	n.a.	n.a.
Divorced			n.a.	n.a.	n.a.	n.a.	2.0	n.a.	n.a.
Widowed	0	0	n.a.	n.a.	n.a.	n.a.	0.3	n.a.	n.a.
Never married	43.18	33.75	n.a.	n.a.	n.a.	n.a.	47.8	n.a.	n.a.

Variable	Study samples		GLSS6 (2012/2013)				DHS (2014)		
	Chicken	Tilapia	National (GLSS6)	Urban (GLSS6)	Greater Accra Region (GLSS6)	Urban Accra	National	Urban	Greater Accra
Employment status:									
Employed	91.32	91.75	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Not employed	4.71	3.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Employment status (DHS, female 15–49)									
Employed	91.43	91.88	n.a.	n.a.	n.a.	n.a.	73.4	73.0	76.0
Not employed	6.98	6.88	n.a.	n.a.	n.a.	n.a.	26.6	27.0	24.0
Employment status (DHS, male 15–49)									
Employed	90.91	91.25	n.a.	n.a.	n.a.	n.a.	82.3	79.1	81.1
Not employed	5.69	8.75	n.a.	n.a.	n.a.	n.a.	27.7	20.9	19.0
Religion:									
Christian	83.87	90.75	n.a.	n.a.	n.a.	85.6	n.a.	n.a.	n.a.
Islam	15.38	8.25	n.a.	n.a.	n.a.	11.8	n.a.	n.a.	n.a.
Traditional	0.5	0.25	n.a.	n.a.	n.a.	0.0	n.a.	n.a.	n.a.
No religion/Other	0.0	0.25	n.a.	n.a.	n.a.	2.7	n.a.	n.a.	n.a.
Religion (DHS, female):									
Christian	83.81	91.88	n.a.	n.a.	n.a.	n.a.	80.2	n.a.	n.a.
Islam	15.56	7.5	n.a.	n.a.	n.a.	n.a.	15.2	n.a.	n.a.
Traditional	0.32	0	n.a.	n.a.	n.a.	n.a.	2.0	n.a.	n.a.
No religion/Other	0.32	0.31	n.a.	n.a.	n.a.	n.a.	2.7	n.a.	n.a.
Religion (DHS, male):									
Christian	84.09	86.25	n.a.	n.a.	n.a.	n.a.	73.2	n.a.	n.a.
Islam	14.77	11.25	n.a.	n.a.	n.a.	n.a.	17.6	n.a.	n.a.
Traditional	1.14	1.25	n.a.	n.a.	n.a.	n.a.	3.3	n.a.	n.a.
No religion/Other	0	1.25	n.a.	n.a.	n.a.	n.a.	5.9	n.a.	n.a.
Ethnic group:									
Akan	49.52	34.38	n.a.	n.a.	34.5	n.a.	n.a.	n.a.	n.a.
Ga Dangme	15.71	23.8	n.a.	n.a.	30.8	n.a.	n.a.	n.a.	n.a.
Ewe	13.33	28.13	n.a.	n.a.	20.7	n.a.	n.a.	n.a.	n.a.
Others	22.05	13.69	n.a.	n.a.	14	n.a.	n.a.	n.a.	n.a.
Household size	4.25	4.45	4.0	3.6	3.4	3.4	3.5	3.1	
Children below 18 years (%)	52.5	51.2	26.3 (male 19 years and below); 25.87 (female 19 years and below)	25.1 (male 19 years and below); 25.9 (female 19 years and below)	n.a.	22.1 (male 19 years and below); 22.7 (male 19 years and below);	50.1 (19 years and below)	46.3 (19 years and below)	n.a.

Source: IFPRI consumer exit survey (2018).
Note: To match the Demographic and Health Survey (DHS) data with our sample, we combine the DHS category for primary and junior high school in our sample as “finished primary,” and the marital status variable “single” in our dataset is matched with “never married” in the DHS dataset. GLSS6 = Ghana Living Standards Survey, round 6; n.a. = not applicable; BECE = Basic Education Certificate Examination; SHS = senior high school.

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