



Consumers' willingness to pay for quail products in Tamale metropolis, Ghana

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ABSTRACT

This study examines consumers' willingness to pay a higher price premium for quail products using the price of chicken as a benchmark. A double-bounded dichotomous choice contingent valuation was used to elicit the data, and the factors influencing consumers' willingness to pay (WTP) were identified using the ordered logit regression model. Results revealed that on the average consumers were willing to pay a higher price premium for quail products, with the mean WTP of GH¢ 27.46 (\$5.66), representing 196.14% price premium and GH¢26.34 (\$5.43) representing 196.03% price premium per crate of eggs and 1kg of quail meat, respectively. These findings are crucial for the development of the products as well as formulating marketing strategies for its promotion in the African food markets.

1. Introduction

As the world's population increases tremendously (nearly 7 billion), the conventional sources of animal protein are becoming insufficient to meet the emerging demand. One of the primary sources of animal protein is poultry products (meat and eggs). It is an undeniable fact that the consumption of poultry product is also fast increasing across many cultures and stages of economic development. In Ghana, the poultry industry consists of chicken, turkey, duck, and guinea fowl with chicken taking the largest share of the sector. According to Ministry of Food and Agriculture [1], the domestic poultry meat production in 2015 stood at 57, 276 metric tonnes which are inadequate to meet the consumption demand attracting an import of 35, 369.07 metric tonnes to clear the market. As a result, government and other institutions are investing in ways of reducing imports of chicken by exploring into other sources of poultry products other than the chicken. Moreover, due to a change in lifestyle, there is a tremendous change in consumers' behavior and health consciousness. This change in consumers' lifestyle has increased the demand for other sources of meat with high nutritional value.

One of the sources of meat that can be considered as a competitive

source against broiler meat is the quail meat. Quail, like chicken, and their products can be consumed in the same way as chicken, but better in terms of nutritional and medicinal benefits [2]. The eggs of quail can be consumed whole, sliced in salads or served boiled with a sauce and the meat which is considered as a delicacy may be fried, roasted or steamed for soup. The quails are the smallest poultry species that are farmed for eggs and meat and are usually found in Asia, Europe, America, and Australia. The most common quail species is the Japanese quail (*Coturnix Japonica*), which are hardy, disease resistant, and require utility [2]. With regards to composition, quail products have exciting features which aid in its marketing. Quail products (eggs and meat) have high consumer acceptability due to their positive perceptions [3,4].

The nutritional value of quail egg is much higher than those offered by other eggs since they are rich sources of antioxidants, minerals, and vitamins, and give us a lot of nutrition than other foods [5]. It also has low fat, low cholesterol, and fewer calories but at the same time, rich in proteins, vitamins, essential amino acids, unsaturated fatty acids, and phosphorus [5]. Moreover, Tunsaringkan [6] observed that the regular consumption of quail meat and egg helps fight many diseases because it is a natural fighter against digestive tract disorders such as stomach

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ulcers. The quail products also strengthen the immune system, promote memory health, increase brain activity, stabilize the nervous system, help with anemia by increasing the level of hemoglobin in the body while removing toxins and heavy metals [6]. All these characteristics make it an excellent food for a health-conscious consumer.

Ghana has witnessed a five-fold increase in population since the first post independence census in 1960 [7] and rising incomes of people has led to the increased demand and diversification of various foodstuff, including meat and eggs. However, consumers are not only concerned with just diversifying their food but also are more concerned about the positive benefits of what they consume. Furthermore, consumers with more information on food safety issues tend to shift their demand for food from “eating fully” to “eating well” or “eating safely” resulting in consumers’ willingness to pay for higher premiums for such food [8,9]. Despite the change in consumers’ awareness and demand for healthy food, there is a lack of empirical studies on the willingness to pay for quail products. In sustaining consumers’ interest in nutrition and health benefits of diet, there is a need for an empirical study on consumers’ willingness to pay for quail eggs and meat and the factors that influence consumers’ willingness to pay a premium for quail meat and eggs.

Raising quail for commercial purposes has the potential of creating an exciting business niche. For instance, broiler and turkey have enormous carcass and breast weight as well as breast yield, and this makes quail meat which has no carcass the best alternative to other poultry as a source of animal protein [10]. This suggests an urgent need for a comprehensive market study to take advantage of the available latent market and reap the benefits associated with it. Moreover, many people in developing countries such as Ghana suffer from hunger and are also deficient in major essential nutrients such as protein. Quail products and its marketing can be used as a tool to fight malnutrition, hunger as well as a source of creating employment opportunities. This is because quail farming is less expensive, hence poor households can easily take it up as a source of income. In Ghana, the primary sources of poultry birds are chicken, duck, turkey, and guinea fowl. However, recent studies indicate that quail farming is gradually finding its way into the market and it’s being introduced by poultry farmers to enhance nutritional value in the poultry industry and also as a means of diversifying the dietary source of protein. It has, therefore, become imperative that consumers attitudes towards this new product been introduced into the market be studied in detail. Identifying consumers’ attributes regarding a particular product is a guide for market development and penetration by that product. The present study was conducted in Tamale metropolis, Ghana, and seeks to investigate whether quail products (eggs and meat) recently introduced into the market is competitive against chicken products. Understanding consumers’ behavior towards quail products is of critical importance for market development and penetration, enabling poor households to tap into this opportunity to improve their health status and livelihoods. The uniqueness of this study is that this is the first agricultural marketing study on quail products in Ghana.

2. Methodology

2.1. The study area, sampling, and data collection techniques

The sampling and data collection approach consisted of a household survey where a multi-stage sampling technique was used for the selection of the respondents. There are three sub-metro in the Tamale metropolis, namely: central sub-metro, north sub-metro, and south sub-metro and were all considered for the study. First, two communities were randomly selected from each sub-metro, making a total of six communities. Second, 25 households were then selected from each of the six communities making a total sample size of 150 respondents for the study. Because the focus of the research is about food consumption, household members who play significant roles in food shopping, cooking, or allocation and disposal of income for food purchasing were made to answer the questionnaire. The face-face method of data collection was

used because the respondents’ concerns could be addressed at hand by the interviewers, and further explanations, which guaranteed a higher response rate. During the interview, we made use of visual aids of the quail bird, its packaged meat, and eggs as indicated in Fig. 1. However, the respondent was free to infer a response from another knowledgeable household member when necessary. The study used the contingent valuation approach to elicit information from the respondents.

2.2. Conceptual framework

Contingent Valuation Methods (CVM) have over the years been used to assess consumer preferences for non-market goods in many studies though other economic methodologies exist [11,12]. The CVM has been applied recently to measure consumer preferences for new products or products with unique qualities, such as genetically modified products, certified safe vegetables, among others [13–15]. CVM ask respondents hypothetical questions about their willingness to pay for products that are new or have specific attributes without purchasing the product. This procedure is done through elicitation of the value of WTP by asking the respondent the amount of money he/she is willing to pay for the product by creating a possible market. In our case, a number of steps were followed: 1) the use of visual aids first defined the products of interest (quail meat and egg); 2) nutritional benefits of the products compared to chicken; and 3) the market structure under which the quail products are delivered were well explained to the consumers. In conformity to economic theory, respondents were made to consider their budget and that if they pay a higher price for quail products, they might have to reduce expenditure on other food products. In this case, it is assumed that respondents select alternatives that provide them the maximum level of utility subject to their budget constraint.

CVM is inclined to some biases such as strategic bias, information bias, starting point bias, and possible bias. Under strategic bias, there is a probability of the respondent having positive sentiments to affect the level of the product of interest by intentionally stating a higher price or a lower price [16,17]. Thus, the strategic bias occurs when the respondents hide the right WTP by deliberately trying to influence either their payment obligation or the level of provision of the product through the stated valuations [18]. The study, therefore, tried to minimize such biases by advising and encouraging the respondents to be very sincere since their decision may not influence policy directly should the product exist in the real market. This approach is called “cheap talk” technique of reducing strategic bias [19]. The information and hypothetical biases occur as a result of the respondents not having complete knowledge about the product [20]. This could happen because the researcher, rather than real, creates hypothetical products and its market. Again, the study reduced these biases by: including household members who have a hand in household consumption and have previously purchased chicken meat and chicken eggs hence are aware of their market prices, and providing adequate, precise and meaningful information about quail products and its nutritional benefits.

Further, respondents were consistently reminded about their budget constraint as well as the quantity of the quail products valued at the given price to reduce information bias. Little [21] indicated that the use of the double-bounded dichotomous choice (DBDC) itself reduces hypothetical biases. Starting point bias may result from the use of the initial values by the respondent to make his/her decision. This could be a problem because if the respondent is misled or did not understand the concept from the beginning, he/she may use the initial value or the first bid to decide on the next question rather than the market price. This is reduced by using random starting bids generated from average market prices [18].

There are two main types of information elicitation using CVM, closed-ended and open-ended. Both closed-ended and open-ended could either be the single bounded dichotomous choice (SBDC) or double-bounded dichotomous choice (DBDC). The SBDC provides the respondents with just YES or NO decision on only one bid price while the



Fig. 1. From left; quail and chicken eggs, quail bird, and quail meat.

DBDC offer YES or NO decision with multiple price bids. In the SBDC, the respondents are asked if they are willing to pay a premium for the product being marketed. The responses are YES or NO, leading to binary outcomes only. The study employed the DBDC approach proposed by [11]; together with the open-ended question. The DBDC approach is asymptotically more efficient and produces fewer bias estimates than conventional single-bounded [11].

Statistically, the double-bound technique is simple, incentive compatible and provides tighter confidence intervals compared to the single-bounded approach [17]. In the open-ended DBDC, the respondents were asked to state the maximum premium price above the price of 1kg of chicken meat and a crate (30 eggs per crate) of the egg they were willing to pay for the same quantity of quail meat and eggs.

The double-bound is a two-step procedure. In the first stage, the respondent is asked if he/she is willing to pay a sure bid for the product after hypothetically knowing the outcome. In the second stage, a lower or higher bid is offered depending on the response to the first bid. If the opening bid is accepted (denoted by B_F), the second higher bid (B_{SH}) is provided; otherwise, a bid (B_{SL}) lower than the first is offered. Using the open-ended DBDC technique in this study, a general question was first asked: “are you willing to pay more for quail meat and eggs.” The answer was Yes or No. Two questions then followed a yes response. A respondent who was willing to pay more for the product was then permitted to state a specific price he was ready to pay based on an outcome from a tossed dice containing ‘four percentages’ (25%, 50%, 75%, and 100%). If the response from the outcome of the dice is Yes (the first bid), a second higher bid is presented to him or her to decide whether he or she is going to pay or not. If the answer to the first bid is No, a second lower bid was presented based on percentages (20%, 30%, 40%, and 50%).

Thus, each respondent provides two responses to two successive bids leading to four possible outcomes: ‘YES-YES,’ ‘YES-NO,’ ‘NO-YES’ and ‘NO-NO.’ If the response YES-YES (B_{SH}, ∞) is observed, the respondent is willing to pay both the first and the second bid for quail meat and eggs

and this respondent is called the highest WTP bidder. A YES-NO (B_F, B_{SH}) means the respondent is willing to pay for the first bid but not the second bid and he/she can be said to be a moderate WTP bidder. NO-YES (B_{SL}, B_F) response referred to a respondent who is not willing to pay the first bid but willing to pay the second lower bid and is called a lower WTP bidder. A consecutive NO-NO ($-\infty, B_{SL}$) response implies the respondent is not interested in paying for both the first and the second lower bid and such a respondent is called the lowest WTP bidder, not a zero WTP bidder. The consumers who were not willing to pay more for the quail products are denoted by zero WTP. Fig. 2 provides a summary of the CVM elicitation approaches used by the study.

2.3. Estimation procedure

The factors influencing consumers’ willingness to pay a premium price for quail eggs and meat was estimated using an ordered logit regression model. With the ordered logit model, there exists a continuous latent preference function for the respondent that motivates his/her decision to pay and the price to pay for the product. What we observe is his decision to pay a specific premium price, which subjects him/her to a standard DBDC situation. The latent continuous variable is a linear combination of explanatory variable and the error term which is logistically distributed. The ordered logit can be specified as;

$$y_i^* = \sum_{i=1}^n z_i \beta + \varepsilon_i \tag{1}$$

The observed dependent (which is ordinal) takes on the value 0 to m -categories and can be expressed as;

$$y_i = j \Leftrightarrow \lambda_{j-1} < y_i^* < \lambda_j \tag{2}$$

where y_i is consumers’ willingness to pay for quail meat and eggs, y_i^* is a latent and continuous variable measuring the consumers’ WTP category,

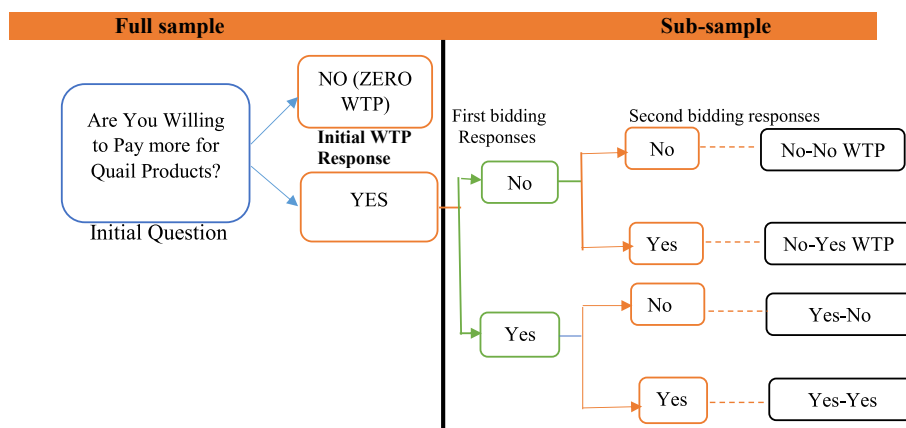


Fig. 2. Contingent Valuation Method (CVM) elicitation approach for quail products.

z_i denotes a vector of explanatory variables, β is a parameter to be estimated, ε_i is a random error term accounting for unobserved characteristics and λ is the cut-off point or the threshold parameter.

The DBDC under the CVM framework produces five outcomes (0–4) that are mutually exclusive. From equation (5), we assume $\lambda, \lambda_1, \lambda_{SL}$, and λ_{SH} represent the observed WTP, the first bid, second lower bid, and the second higher bid, respectively. Then the following consumers can be observed: those who were not willing to pay extra for the quail products (zero WTP); those who responded ‘NO’ to both bids (‘NO–NO’ WTP); those who responded ‘NO’ to the first bid but ‘YES’ to the second lower bid (‘NO–YES’ WTP); those who responded ‘YES’ to the first bid but ‘NO’ to the second lower bid (‘YES–NO’ WTP); and those who responded ‘YES’ to both bids (‘YES–YES’ WTP). These schemes can be expressed as follows:

$$\begin{aligned}
 y_0 &= 0 \text{ if } y_i^* \leq 0_{zero} \text{ WTP} \\
 y_1 &= 1 \text{ if } < y_i^* \leq \lambda_1 \text{ no} - \text{no WTP} \\
 y_2 &= 2 \text{ if } \lambda_1 < y_i^* \leq \lambda_2 \text{ no} - \text{yes WTP} \\
 y_3 &= 3 \text{ if } \lambda_2 < y_i^* \leq \lambda_3 \text{ yes} - \text{no WTP} \\
 y_4 &= 4 \text{ if } y_i^* \leq \lambda_3 \text{ yes} - \text{yes WTP}
 \end{aligned} \tag{3}$$

Following [28], the following ordered logit probabilities of m-categories are expressed under the assumption of Gaussian errors;

$$\pi\left(y_i \leq \frac{j}{z_i}\right) = \wedge(\lambda_j - z_i' \beta) - \wedge(\lambda_{j-1} - z_i' \beta) \tag{4}$$

Through the use of the general logit framework;

$$\pi\left(y_i \leq \frac{j}{y_i}\right) = \wedge(y_i^*) = \frac{\mathcal{L}_i^*}{1 + \mathcal{L}_i^*} = \frac{1}{1 + \mathcal{L}^{-y_i^*}} \tag{5}$$

and the probabilities of each ordered outcome are given by;

$$\begin{aligned}
 \pi_0(y_i = 0/z_i) &= \wedge(-z_i' \beta) \\
 \pi_1(y_i = 1/z_i) &= \wedge(\lambda_1 - z_i' \beta) - \wedge(-z_i' \beta) \\
 \pi_2(y_i = 2/z_i) &= \wedge(\lambda_2 - z_i' \beta) - \wedge(\lambda_1 - z_i' \beta) \\
 \pi_3(y_i = 3/z_i) &= \wedge(\lambda_3 - z_i' \beta) - \wedge(\lambda_2 - z_i' \beta) \\
 \pi_4(y_i = 4/z_i) &= 1 - \wedge(\lambda_3 - z_i' \beta)
 \end{aligned} \tag{6}$$

Combining these five probability outcomes, the parameters can be consistently and efficiently estimated using maximum likelihood (ML) criteria with a log-likelihood function expressed as;

$$\ln l = \sum_{i=1}^n \{d^{yy} \ln^{yy}(\lambda_i, \lambda_{SH}) + d^{nn} \ln^{nn}(\lambda_i, \lambda_{SH}) + d^{ny} \ln^{ny}(\lambda_i, \lambda_{SL}) + d^{mm} \ln^{mm}(\lambda_i, \lambda_{SL}) + d^c \ln^c(\lambda_i)\} \tag{7}$$

where $d^{yy}, d^{nn}, d^{ny}, d^{mm}$ are dummy variables taking the value 1 if the statement is true and 0 if otherwise.

The empirical model for analyzing the determinants of consumers’ willingness to pay a price premium for quail products (meat and eggs) can be specified as;

$$\ln\left(\frac{\pi_i}{1 - \pi_i}\right) = \sum_{i=1}^n \beta_i z_i + \varepsilon_i \tag{8}$$

2.4. Description of variables used in the model

The dependent and the explanatory variables included in the model and their summary statistics are described in Table 1, while the mean WTP for quail eggs and meat are reported in Table 2. Table 2 indicates that the majority (68%) of the respondents were willing to pay a premium for the quail products while 32% were not willing to pay any price above the price of the chicken products. Among those who were willing to pay extra, 8 and 6.8% were not willing to pay any of the bids they selected for quail eggs and meat, respectively while 6 and 8.67% were not willing to pay the first bid but willing to pay the second lower bid for eggs and meat, respectively. About 16.67% of the interviewed

Table 1 Summary statistics of the variables used in the model.

Variable	Description	Measure	Mean (SD)
Dependent Variables			
<i>Quail eggs</i>			
Zero WTP	Zero WTP	Not willing to pay a price premium for quail products (%).	32.00%
N/N WTP	NO–NO	Not willing to pay any of the bid (%).	8.00%
N/Y WTP	NO–YES	Not willing to pay first bid but willing to pay the second lower bid (%).	6.00%
Y/N WTP	YES–NO	Willing to pay the first bid but not the second higher bid (%).	16.67%
Y/Y WTP	YES–YES WTP	Willing to pay both the first and the second higher bid (%).	37.33%
<i>Quail meat</i>			
Zero WTP	Zero WTP	Not willing to pay a price premium for quail products.	32.00%
N/N WTP	NO–NO	Not willing to pay any of the bid.	6.67%
N/Y WTP	NO–YES	Not willing to pay first bid but willing to pay the second lower bid.	8.67%
Y/N WTP	YES–NO	Willing to pay the first bid but not the second higher bid.	16.67%
Y/Y WTP	YES–YES WTP	Willing to pay both the first and the second higher bid.	36.00%
Gender	Gender	Dummy; 1 if respondent is a male.	0.39 (0.48)
M_S	Marital status	Dummy; 1 if respondent is married.	0.79 (0.86)
HHS	Household size	Number of persons in the household.	5.56 (3.34)
Ed_S	Educational status	Dummy; 1 if respondent had attained formal education.	0.87 (0.34)
#_CE	Purchase of chicken Eggs	Frequency of purchase per week.	2.18 (1.22)
#_CM	Purchase of chicken meat	Frequency of purchase per week.	2.19 (1.16)
Aw_Q	Awareness of quail bird	Dummy; 1 if respondent is aware of quail bird.	0.71 (0.45)
LY	Low-income households	Dummy; 1 if consumers’ monthly income < GH¢500, otherwise 0.	0.24 (0.44)
MY	Middle-income households	Dummy; 1 if consumers’ monthly income is between GH¢ 500 and GH¢ 1,000, otherwise 0.	0.35 (0.48)
HY	High-income households	Dummy; 1 if consumers’ monthly income is greater than GH¢1000, otherwise 0.	0.41 (0.42)

Note: SD denotes standard deviation.

Table 2 Distribution of total WTP and MWTP.

Statistics	MWTP (GH¢)	% Increment of price premium	Minimum (GH¢)	Maximum (GH¢)
Quail eggs/ crate	27.46	196.14	13.50	50.00
Quail meat (1 kg)	26.34	196.03	14.00	50.50

MWTP denotes mean willingness to pay.

consumers reported that they were willing to pay the price selected as the first bid but not willing to pay for the second higher bid for both products. For both the first and the second higher bid price, about 37.33% and 36% reported yes to quail eggs and meat, respectively.

With regards to the explanatory variables, the majority (about 61%) of the respondents in the data set were women. This is so because, in typical Ghanaian society, men provide the financial means of running the home while women are the administrators of the house with roles including deciding on the type of food the household consumes, cooking, washing, and performing other household chores. About 87% of the respondents have had formal education.

Table 3
Mean comparison tests of determinants of consumers' WTP across the categories.

	Zero WTP	<u>WTP for Quail Eggs</u>				F-stat.	Zero WTP	<u>WTP for Quail Meat</u>				F-stat.
		N/N WTP	N/Y WTP	Y/N WTP	Y/Y WTP			N/N WTP	N/Y WTP	Y/N WTP	Y/Y WTP	
Gender	0.35	0.20	0.40	0.40	0.40	0.57	0.35	0.40	0.40	0.40	0.41	0.14
M_S	0.54	0.70	0.80	0.60	0.70	0.60	0.54	0.80	0.60	0.70	0.64	0.63
HHS	5.00	5.40	4.90	6.50	5.80	1.06	5.00	5.20	5.10	6.40	5.83	0.87
Ed_S	0.85	0.60	0.80	0.90	0.90	1.95	0.85	0.70	0.90	0.90	0.89	1.30
#_CE	2.19	1.90	2.20	2.50	2.10	0.68	2.18	1.90	2.70	2.40	2.05	0.93
#_CM	2.13	2.60	2.20	2.40	2.10	0.64	2.13	2.30	1.80	2.40	2.18	0.65
Aw_Q	0.63	0.50	0.50	0.90	0.80	2.93 ^b	0.63	0.80	0.60	0.80	0.77	1.18
LY	0.35	0.40	0.15	0.16	0.20	1.58	0.35	0.42	0.22	0.12	0.20	1.94
MY	0.27	0.60	0.54	0.44	0.30	1.94	0.27	0.50	0.44	0.44	0.34	0.93
HY	0.31	0.06	0.08	0.24	0.26	2.28 ^c	0.31	0.08	0.06	0.24	0.25	2.09 ^c

N/N, N/Y, Y/N, and Y/Y, respectively denotes the four bids used to elicit consumers' WTP. b denotes significance level at 5%, F-statistic from ANOVA.

Among those who had formal education, 51% and 27% had schooled up to secondary and tertiary levels, respectively. Education is a critical human capital that influences peoples' ability to acquire, synthesize, and espouse information easily. The high level of education among the respondents suggests a high level of knowledge on food consumption that could translate into a better understanding of the WTP scenario. On average, consumers in our data set consume chicken products two days in a week. About 71% of the respondents were aware or have heard of quail bird and their products. While some consumers had their sources of information about awareness from the "Holy Book, The Bible," others revealed they got to know quail bird from social media such as Facebook, Twitter, among others. Few other respondents reported their sources of information from friends and relatives as well as radio/television and newspapers. Moreover, the majority (76%) of the consumers interviewed belong to the middle and high-income class.

The estimated mean based on the elicitation methods indicates that consumers were willing to pay GH¢27.46 (\$5.66) for a crate of quail eggs and GH¢26.33 (\$5.43) per kilogram of quail meat. This implies an increase of 196.14% and 196.04% over the average price of GH¢13.5 (\$2.78) and GH¢14.00 (\$2.89) for a crate of chicken eggs and 1 kg chicken meat, respectively.¹ These results indicate a relatively high mean WTP than those in previous studies [15,18], across Sub-Saharan Africa.

2.5. Mean comparison tests for determinants of consumers' WTP for quail products

Table 3 discusses the descriptive statistics and the mean comparison tests of factors affecting consumers' willingness to pay for different bids offered to them using F-statistic from ANOVA. The results indicate that most (65%) of female respondents were not willing to pay extra for the quail products (both eggs and meat). However, among the females who were willing to pay extra, 80% and 60% were not ready to pay any of the bids they selected for eggs and meat. About 40% of the females were willing to pay the highest bid (Y/Y) for eggs and meat. Majority of consumers who are married were willing to pay extra for quail products as compared with those who are not married. Surprisingly, households with a larger number of persons were willing to pay a higher premium (Y/N and Y/Y) for the products. This is contrary to the notion that larger families tend to minimize their consumption of expensive products, including food due to limited resources relative to their size. However, it is not surprising to know that a more substantial fraction of the respondents who had formal education was willing to pay more for the products. This could be attributed to their level of knowledge. Moreover, there is an even distribution between consumers who were not willing to pay more and consumers who are willing to pay extra for the quail products regarding how often they consumer chicken products in a

week. On average, consumers in all the WTP categories consumed chicken twice per week. With regards to awareness, a more significant proportion of consumers who were aware of the availability of the products were willing to pay a higher premium for them. There were also differences observed across the various bids concerning consumers' income levels.

Significant differences were observed across the different bids of quail eggs and meat among the high-income households. The study also elicited the mean WTP for quail products based on the double-bounded CVM approach, and the results are presented in Table 3.

2.6. Determinants of WTP for quail products

The parameter estimates and marginal effects (at sample means) from the ordered logit model of factors explaining the variation in consumers' WTP for quail products are presented in Tables 4 and 5, respectively. Since the coefficient estimates do not provide adequate information concerning magnitudes, the studies will use the marginal effect values to interpret the results from the regression model. From Table 5, the probability of consumers' WTP more for quail eggs decreases with married consumers probability of choosing NO-YES option but increases with same consumers' probability choosing YES-NO and YES-YES option by 0.4%, 0.78%, and 7.2%, respectively. For quail meat, marital status increases the likelihood of selecting a YES-YES option by 6.6%. This generally implies that married men and women were willing to pay a premium for these products compared with their unmarried counterparts. This could be that married people are more "family-oriented" and more concern about the nutritional status of their families, especially their children. Many pieces of literature [15,22,23] have documented the significant influence of household size on household food choices.

An increase of the household size by one person increases the

Table 4
Estimated coefficients from the ordered logit model WTP of Quail products.

Variable	<u>Quail Eggs</u>		<u>Quail Meat</u>	
	Coefficient	St. Error	Coefficient	St. Error
Gender	0.4432	0.3921	0.3804	0.3885
M_S	0.5696	0.3268 ^c	0.2877	0.0878 ^a
HHS	0.1007	0.0511 ^b	0.0763	0.0418 ^c
Ed_S	0.8121	0.2529 ^a	0.6029	0.1580 ^a
#_CE	-0.0566	0.1525	-0.0993	0.1526
#_CM	0.1024	0.1833	0.1517	0.1842
Aw_Q	0.1747	0.0096 ^a	0.1446	0.0095 ^a
LY	-0.7833	0.4080 ^c	-0.8984	0.4100 ^b
HY	0.4761	0.4088 ^c	0.4975	0.4059
/cut1	0.2487	2.0838	3.1837	1.4266
/cut2	0.3942	2.0849	3.5446	1.4337
/cut3	0.8062	2.0875	3.8512	1.4402
/cut4	1.7104	2.0839	4.4337	1.4516

Note: a, b, and c denote significance level at 1%, 5%, and 10%, respectively.

¹ There are 30 pieces of eggs per crate (box) for both chicken and quail.

Table 5

Estimated marginal effects from the ordered logit model of the determinants of WTP for Quail products.

Variable	<i>WTP for Quail Egg model</i>					<i>WTP for Quail Meat Model</i>				
	Zero WTP	N/N WTP	N/Y WTP	Y/N WTP	Y/Y WTP	Zero WTP	N/N WTP	N/Y WTP	Y/N WTP	Y/Y WTP
Gender	-0.0989	-0.0063	-0.0055	0.0108	0.1000	-0.0856	-0.0075	-0.0020	0.0079	0.0872
M_S	-0.0714	-0.0046	-0.0040 ^c	0.0078 ^c	0.0721 ^c	-0.0647	-0.0057	-0.0015	0.0060	0.0659 ^c
HHS	-0.0188	-0.0012	-0.0011	0.0021 ^b	0.0190 ^c	-0.0172	-0.0015 ^c	-0.0004	0.0016 ^c	0.0175 ^c
Ed_S	-0.1813	-0.0116	-0.0102	0.0198 ^a	0.1832 ^b	-0.1357	-0.0119	-0.0032	0.0126	0.1381 ^b
#_CE	0.0126	0.0008	0.0007	-0.0014	-0.0128	0.0223	0.0020	0.0005	-0.0021	-0.0227
#_CM	-0.0229	-0.0015	-0.0013	0.0025	0.0231	-0.0341	-0.0030	-0.0008	0.0032	0.0348
Aw_Q	-0.0390 ^a	-0.0025 ^a	0.0022 ^a	0.0043 ^a	0.0394 ^c	-0.0325 ^a	-0.0028 ^a	0.0008 ^a	0.0030 ^a	0.0331 ^b
LY	0.1677 ^c	0.0176 ^c	0.0102	-0.0196 ^a	-0.1760 ^b	0.1937 ^b	0.0222 ^c	0.0077	-0.0175	-0.2061 ^b
HY	-0.1019 ^c	0.0107	0.0062	0.0119	0.1069 ^c	-0.1073 ^c	0.0123	0.0043	0.0097	0.1140 ^c

N/N WTP, N/Y WTP, Y/N, and Y/Y WTP denote NO–NO, NO–YES, YES–NO, and YES–YES willingness to pay bidders, respectively.

a, b, and c denote significance levels at 1%, 5% and 10% respectively, z-statistic from the ordered logit model. The marginal effects represent a percentage change in the consumers' willingness to pay when a given independent variable changes by one percentage.

probability of a consumer selecting YES–NO and YES–YES option by 0.2% and 1.9%, respectively for quail eggs, and 0.2% and 1.75%, respectively for quail meat, while it decreases the probability of choosing NO–NO option for quail meat by 0.2%. The likelihood of household size increases the possibility of paying more for quail products is against the study's *a priori* expectation. This is because a household with more members have higher food expenditure, and since quail products are more expensive than chicken products, families were expected to reduce their spending on food by offering to pay less. However, it could also be because households with more members are more concerned about their health due to the belief that members may be vulnerable to contagious diseases such as cough, tuberculosis, among others.

Education is a critical human capital that makes people attach importance to all facets of life, especially what they consume. This suggests that consumers with a higher level of educational attainment are more likely to pay a premium for a product with a high level of health benefits like quail. As expected, consumers with formal education are about 0.2% and 18% more likely to pay for the YES–NO and YES–YES bids, respectively for quail eggs and 13% more likely to pay for quail meat. This is consistent with many studies [24,25], that consumers who have had higher education show positive willingness to pay attitudes.

In line with the study's expectation, consumers who were not aware of the availability of quail products showed negative attitudes towards WTP (zero WTP) and WTP more (NO–NO option) for both quail eggs and meat products. Thus, the marginal effects of awareness for zero WTP and NO–NO choice for quail eggs are 3.9% and 0.3%, respectively, while that for quail meat is 3.3% and 0.3%, respectively. Moreover, consumers' awareness increases with the probability of been higher bidders of both products. They are about 0.2%, 0.4% and 4% more likely to bid for NO–YES, YES–NO and YES–YES option, respectively for quail eggs, and about 0.08%, 0.3% and 3.3% more likely to select the same bids option for quail meat. A study in Ghana by [15] estimated an inverse relationship between consumers WTP for organic vegetables and consumers' knowledge of the availability of the product.

Furthermore, the study reveals some differences between consumers' willingness to pay for a price premium among low-income, middle-income, and high-income households. Low-income and high-income households were compared with middle-income households since middle-income families were set as the baseline for the ordered regression model. The probability of choosing zero WTP and NO–NO bid option increases by 16.7% and 1.8% respectively, suggesting that consumers were not willing to pay (zero WTP) and not willing to pay any of the selected options (NO–NO) for quail eggs if they are low-income earners. However, the probability of choosing YES–NO and YES–YES bids decreases by 2% and 17.6%, respectively. Similarly, the likelihood of low-income households selecting the option zero WTP and NO–NO increase by 19.4% and 2.2%, respectively, while the possibility of choosing YES–YES decreases by 20.6%. For High-income earners, they

were about 10% and 11% less likely to have zero WTP for quail eggs and meat, respectively. As expected, their likelihood of paying the highest premium for the eggs and meat increases by approximately 11%. This is an implication that high-income households were willing to pay extra and were more likely to form positive attitudes towards food products with high nutritional contents [26,27].

3. Conclusions and recommendations

Consumers' awareness and other socioeconomic factors are critical as they influence their willingness to pay the price for that product. The objective of this paper was to understand consumers' willingness to pay a price premium for quail products, eggs, and meat and the corresponding determinants of WTP. The results revealed that consumers were willing to pay a high premium (about \$5) each, for a crate of quail eggs and 1 kg of quail meat to compensate for the high nutritional value of quail products. The findings further indicated that consumers' awareness of the availability of the product, educational status, and level of income were critical determinants of how much they were willing to pay. The study concludes that consumers were more concerned about their health and were ready to sacrifice extra expenditure on food to have a healthy lifestyle. It is, therefore, recommended that government agencies and other stakeholders should pay attention to the study of consumer attitudes towards this product to target the market or create a niche market for the product. This paper will also bring to the attention of the Ministry of Food and Agriculture, and the Ministry of Health in Ghana towards an alternative source of protein and rural livelihood. Farm-level policies oriented towards the strategic development of quail products as tools for fighting malnutrition and poverty are highly recommended. Future research on WTP for quail products may also consider increasing the sample size to cover other metropolitan areas in Ghana.

Data availability and material

Data and material for this study is available upon request.

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Authors contributions

Paulina Brago conceptualized the idea, collected the data and perform analysis. Gideon Danso-Abbeam wrote the methodology, performed the analysis and wrote the first draft. Abiodun A. Ogundeji supervised the study. Joseph Abankwa was actively involved in the data collection and cleaning. Dennis S. Ehiakpor supervised the data collection process. Joseph A. Awuni corrected the final draft. Aurelia Pearl

Aduku took part in the data collection processes and reviewed the final draft. Gilbert Dagunga was actively involved in the data analysis and prepared the manuscript for submission.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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List of abbreviations

WTP	Willingness to pay
MoFA	Ministry of Food and Agriculture, Ghana
GSS	Ghana Statistical Service
CVM	Contigent Valuation Method
DBDC	Double-bounded Dichotomous Choice
SBDC	Single-bounded Dichotomous Choice
Y	Yes
N	No
BSH	Second Higher Bid
BSL	Second Lower Bid
BF	Opening Bid
MWTP	Mean Willingness to pay

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