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Using a screening survey to understand the appeal of poultry meat label attributes to support small-scale producers

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Abstract

Antibiotic use to sustain poultry health has been a controversial and mysterious subject for consumers. Consumers also wonder about terms on packaging such as antibiotic-free, free range, organic, non-GMO, and humanely raised. There is only limited research-based information that explores how consumers perceive poultry meat attributes on various commercial packages. This paper discusses the results of a screening survey to explore consumer perceptions of specific characteristics on packages via convenience samples. We identified attributes based on a literature review and real-time market observations from grocery stores. Results showed diverse responses from 362 participants regarding the attributes and designs on fresh, raw chicken breast packages typically found in grocery stores. Preferences of different attributes were further analyzed using factor analysis and clustered into four similar groups of choices based on labeled meat attribute and label color and design. Factor analysis demonstrated a strong tendency to prefer packages due to "negative" or "positive" labeling

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attributes such as non-GMO that were not present, or attributes such as humanely raised that were labeled as present. The results can assist community organizations and service providers, such as small local food cooperatives, independent grocery stores with a local niche, and Cooperative Extension educators and agents to support local producers in engaging in creative marketing strategies to improve consumer awareness, food safety education, and recognition of differences across terms used on different types of labels.

Keywords
consumer preferences, poultry meat, food safety, local farmers, food labeling

Introduction and Literature Review

From national chain grocery stores to local farm stands, poultry products are among the most popular protein sources (Korver, 2023). Most countries are seeing an increase in poultry meat consumption per capita. For example, from 2000 to 2019 the U. S. saw a steady rise in poultry consumption, from 43.2 kg/capita to 50.1 kg/capita annually (Whitton et al., 2021). Such statistics generate debates in developed countries about reaching peak poultry consumption levels and the best policy practices to manage sustainable increases in consumption across various markets (Kleyn & Ciacciariello, 2021). While demand in the U.S. has steadily risen, the market for poultry products with certain attributes, such as different labels or production claims, is dynamic. What were once niche markets, such as products with organic or antibiotic-free labeling, have now captured a significant portion of market share due to increased popularity among certain demographics of consumers (Parashar et al., 2023). For example, U.S. organic food retail sales for meat, fish, and poultry jumped from US$50 million in 2001 (adjusted for 2021 inflation) to US$2.08 billion in 2021 (U.S. Department of Agriculture Economic Research Service, 2025c). Several studies confirm that consumers have increasingly favorable perspectives on non-conventionally grown poultry meat, supported by their concerns for animal and environmental welfare as well as perceptions that non-conventional poultry is healthier and tastier (Castellini & Dal Bosco, 2017; Mohammadi et al., 2023; Smith-Spangler et al., 2012).

These trends have substantial implications for poultry producers at local, regional, and national levels and at different scales of production: to (1) understand how increasing demand influences practices and management at farm level; (2) acknowledge the new trend of consumer awareness of and preferences about animals wellbeing linking to marketing strategies; and (3) adopt innovative approaches to simultaneously improve the quality of production and of consumption beyond traditional cost-benefit evaluations. Therefore, the direction of the poultry industry is in flux, with competing interests trying to balance increasing demand for poultry consumption while changing the paradigm of how chickens are grown and processed (Kleyn & Ciacciariello, 2021).

This research project sought to better understand current patterns of poultry meat consumption by analyzing high-engagement consumer preferences for specific attributes attached to the poultry products they buy. The information will contribute to the growing discourse on the antibiotic-free movement and help direct-service providers (e.g., Cooperative Extension, community-based health services) and policymakers integrate consumer market profiles and behaviors to enhance overall family and community health and animal well-being. The providers are well-positioned to deliver targeted outreach based on shifting consumer preferences and to support producers in making informed decisions about labeling and marketing (Elliott-Engel et al., 2022; Worley et al., 2024). By integrating consumer behavior data into outreach programming, providers can promote healthier dietary practices and improve the alignment between food production methods and community expectations for animal welfare and environmental stewardship. Therefore, this study intends to benefit producers and the outreach professionals who support them.

The primary purpose of this study is to create a screening survey that targets understanding the characteristics of poultry product labeling before launching a large-scale national survey of a similar

scope. A screening survey is a concise set of questions deployed at the start of research to identify respondents who fit specific criteria or who have relevant characteristics. The Agricultural Resource Management Survey (ARMS), a multiphase questionnaire that asks farmers about their cropping practices and business operations, has continually used screening surveys to gather data to best inform the design of their large-scale questionnaire (U.S. Department of Agriculture Economic Research Service, 2025b). The National Household Food Acquisition and Purchase Survey has also used screening tools to efficiently determine households' eligibility to take part in its survey program (USDA ERS, 2025a). We also consider this study to be filling a research gap in this way, to outline and justify our screening survey as a critical function before launching larger-scale national surveys on consumer behavior. The screening survey is crucial to building a broader research project targeting general poultry production sustainability. Both focus groups and a national survey design will contribute to this overarching research agenda. However, a national survey could not be performed without this initial screening survey.

Before conducting a national survey, the screening survey is intended to validate the factors and characteristics of poultry meat packages in the market. A screening survey is not unusual. However, many Cooperative Extension staff and practitioners do not use this stage. Therefore, in this paper we hope to justify adopting a multi-stage survey approach, and to clarify that we want to show how the screening survey results could be used to narrow down factors in a large-scale study. Results from the screening survey will be used not only to design and develop a national consumer survey, but also to inform farmers about the preferences for information presented on packages and support the design and development of marketing and communication for sustainable transitions of the poultry industry moving forward.

Review of the Poultry Industry and Antibiotic Use

Protein consumption in the U.S. is primarily based on the industrial food animal production system, characterized by large-scale, densely packed animal operations that require external inputs to achieve economies of scale (Franzo et al., 2023). Antibiotic treatment has commonly been used in these operations for disease treatment, disease control, and disease prevention (Wallinga et al., 2022). Antibiotics were also distributed to animals to promote growth. The latter practice was made illegal in 2017 by the Food and Drug Administration in collaboration with the pharmaceutical industry (Gens et al., 2022). However, antibiotics distributed to prevent disease often promote growth, making enforcement of the ban difficult (Patel et al., 2020). Efforts for increased regulation have met with resistance from industrial animal production system stakeholders, who also exploit legislative loopholes (Martin et al., 2015; Singh et al., 2022). Concerns about ongoing agriculture antibiotic use also stem from increasing recognition of the dangers of antimicrobial resistance, which has been labeled as one of the "top global public health and development threats" (World Health Organization, 2023). The main cause of the threat is the misuse and overuse of antibiotics, with antibiotics given to animals at far higher rates than humans (Van Boeckel et al., 2019).

The 2017 repeal of non-therapeutic antibiotic distribution still allows veterinarians to prescribe antibiotics for medicinal purposes; at least thirteen FDA-approved antibiotic treatments can be applied to feed for disease prevention (Wallinga et al., 2022). Veterinarians have autonomy to decide whether a prescription is necessary on a case-by-case basis. This FDA policy differs from both the World Health Organization, which states antibiotic use for disease prevention is unnecessary and a risk to public health (WHO, 2017), and the European Parliament, which banned antibiotics for disease prevention in 2022 and is taking further action to reduce antibiotic use to protect public health (Council of the European Union, 2023).

Veterinarians are given a central role in U.S. distribution of antibiotics on the farm. FDA Guidance #213 and the Veterinary Feed Directive require feed mills to receive an order from a veterinarian before introducing feed with antibiotics to animals, a policy that has come under scrutiny for failing to address antibiotics administered through other avenues besides feed, such as orally, through

injection, or through drinking water (Wallinga et al., 2022). With U.S. federal action lagging behind European policy, certain states are addressing the issue. Maryland state law SB471 of 2019 prohibits poultry antibiotic use that is considered a "regular pattern" (Maryland General Assembly, 2019, p. 1). Under these terms, drugs cannot be administered routinely to an individual chicken or a group of chickens, such as during a specific time of season or when the chickens reach a certain age. The law also introduces a robust reporting policy that tracks which animals are administered antibiotic treatment through strictly necessary medical means, the specific antibiotics used and their active ingredients, and the veterinarian who oversaw the treatment. (The Maryland Department of Agriculture 2022 report "The Use in Maryland of Medically Important Antimicrobial Drugs in Cattle, Swine, and Poultry" makes this collected information available to the public.[1])

California's earlier bill on antibiotic use (SB835) mirrored federal guidelines. With growing calls for more aggressive action on agricultural antibiotic use, SB27 was passed in 2015 to restrict "regular pattern" distribution (Megaro, 2015, p. 3). Preventive use was allowed for medically necessary scenarios. SB27 was also the first law in the nation to require extensive data on antibiotic sales and usage. However, there have been setbacks in overcoming state confidentiality guidelines, which means little of the data is open to the public. The law has also received criticism for not meeting its original goals, partly due to misinterpretations of the law's language (Wallinga et al., 2022). Maryland and California have introduced the most direct actions to restrict antibiotic use, setting an example for other states. New York, Illinois, North Carolina, and Oregon have also started the process of passing similar laws.

Antibiotic use is one of several important attributes displayed on packages across various markets. The safety of poultry meat consumption affects all consumers, regardless of where they purchase (e.g., grocery stores, farmers market, mail order) (Donelan et al., 2016; Topalcengiz et al., 2025). It would be essential to learn how consumers perceive the information shared by producers, often present on the food package labels, regarding antibiotic use and other accompanying attributes (e.g., organic, grass-fed, free range). The revealed preferences may also enhance the design and delivery of services and educational programs to individuals and families via Cooperative Extension and other community-based health services.

Although some of the mandated policies are designed to assist large, commercial-scale poultry operations, antibiotic use in general poultry operations is relevant to small and medium-sized producers as well. There is limited research on interpretation of poultry meat labels (e.g., antibioticfree, organic, free range) by U.S. consumers that would help small farmers and support local food initiatives. A study of consumer preference for different poultry labels focused on large-scale consumerism, however consumers were only buying from large grocery stores (Powers et al., 2020). This contrasts with our focus on small-scale consumerism to assist small farmers and local food groups.

Consumer Preference for Poultry Attributes and Links to Marketing Strategies

Market research has shown that consumers are willing to pay a premium for meat products of higher quality and that have been ethically produced (Fatha & Ayoubi, 2023; Froehlich et al., 2009; Verbeke et al., 2005). Labels are the primary method of conveying this messaging to the consumer, situating labeling as a key component of driving product demand and shaping consumers' preferences and willingness to pay (Newman et al., 2020). Meat labeling has proliferated to differentiate between the increasingly divergent production methods, such as organic, antibiotic-free, free range, and pasture-raised. (Karavolias et al., 2018). Consumers are also heightening their values regarding how their food is produced, situating food labels as a central intermediary between producer and consumer (Van Loo et al., 2014). Several socioeconomic factors are crucial in consumer willingness to pay a premium for meat products, such as income levels (Mohammadi et al., 2023), sex and

[1] See the report at https://dlslibrary.state.md.us/publications/Exec/MDA/AG3-1004(c)_2021.pdf

age (Fatha & Ayoubi, 2023; Feil et al., 2020; Nielen, 2015), education (Kamphuis et al., 2015), and information awareness about the specific product (Karavolias et al., 2018). Social subgroups with increased willingness to pay generally include younger consumers who live in cities and have above-average income to afford to pay for the premiums. They are also more environmentally conscious and use social networks to gain knowledge about food production practices that align with their social and environmental convictions (Ditlevsen et al., 2020).

The poultry industry offers diverse phrases and buzzwords to distinguish between products that may appeal to select consumer subgroups (Thibault et al., 2022). Ten of the most common production claims used in the poultry industry are summarized in Table 1.

Table 1. Ten of the Most Common Production Claims in the Poultry Meat Industry

Antibiotic-free
Organic
Free range
Raised and harvested in the U.S.
Humanely raised
Vegetarian-fed
No animal byproduct
Non-GMO
No hormones or steroids
USDA-certified organic

We have focused on these 10 production claims due to their prevalence in market reports (USDA ERS, 2025c), academic literature (Van Loo et al., 2014), popular media (Lipton, 2014), and actual observations conducted by our research team in grocery stores. While several research studies have measured consumers' willingness to pay a premium for individual products with niche production claims, such as asking what extra a consumer would pay for certified organic poultry meat, there is a research gap comparing consumers' preferences when given the choice between several production claims (Ellison et al., 2017). Such a research approach would more accurately reflect the consumer shopping environment, where they are presented with an abundance of product choices with diverse and often conflicting production claims.

Applied Research Methods

Guiding Theoretical Framework

There are many ways to model or simulate a food system or network strategies. One theoretical framework is the agent-based modeling approach, which represents linkages between agents (e.g., decision-makers, market venues) across various scenarios (e.g., types of products). Many agent-based models use hypothetical characteristics to design or create agents and interactions (Collins & Liang, 2024; Liang & Collins, 2025). An agent-based model usually seeks to capture the interactions and dynamics between agents within the system domain it is being applied to (Oren et al., 2000). The screening survey designed and implemented in this study was intended to gather generally recognized characteristics from different packages of raw meat to inform the traits that would need to be included to design agents and scenarios, which is the initial stage of building an effective agent-based model to simulate market interactions between producers and consumers.

The agent-based model framework has been applied to simulate general behaviors of poultry supply chains to assist small business development within an effective food system (Collins & Liang, 2024; Liang & Collins, 2025). Unlike traditional aggregate models, this approach requires empirically grounded information about how individual producers and consumers perceive product attributes. We therefore needed to obtain some characteristics from real producers and consumers who would serve as the agents in a more realistic modeling aspect. Thus, we use the information from the screening survey to understand how individuals identify characteristics labelled on each package based on individual preferences. The screening survey findings will help us design or define agents' preferences, which are essential to ensure the model outcomes have some meaning to producers and consumers. Our contribution is to introduce a unique approach to using the results of the screening survey to help design and create meaningful

agents within an agent-based model theory framework, unlike traditional models that assume aggregate behavior for each agent.

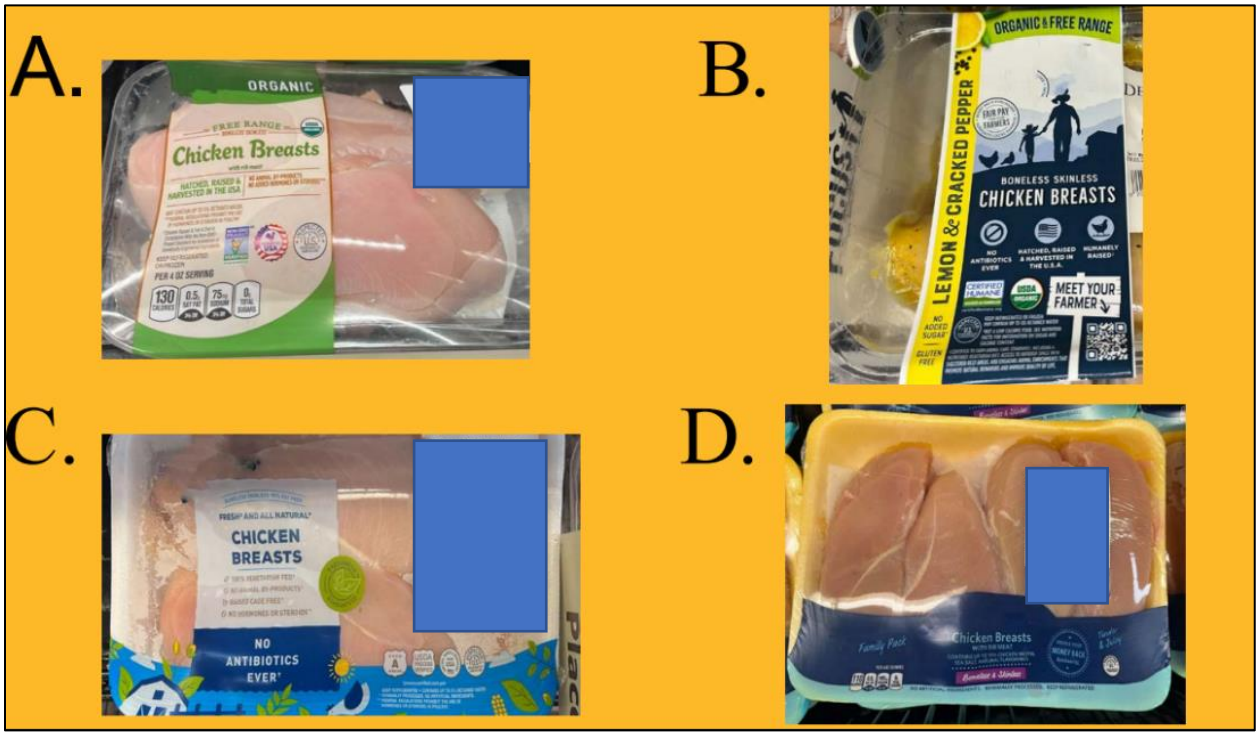
Survey Description

Our screening survey was designed to collect data to capture consumer's shopping preferences when purchasing poultry meat products. It aimed to gather a basic understanding of participants' knowledge and recognition of common poultry meat attributes from package labels; therefore, it is a screening survey. We do not intend to gather data regarding willingness to pay in this stage of our research. The screening survey results are intended to guide the design of a more comprehensive national survey.

The survey instrument was developed through an iterative process that combined a review of academic literature on poultry labeling claims (Van Loo et al., 2014; Powers et al., 2020), USDA ERS market reports (2025c), and direct observations of poultry product packaging across the U.S. While the survey was in the pre-test stage, its structure was reviewed by Cooperative Extension professionals familiar with poultry industry marketing to ensure validity, clarity, and connection to research goals. The binary yes/no format used in the attribute selection section was chosen for ease of completion and to allow for interpretable factor analysis.

The survey has three key components. The first collects background information on shopping habits, asking participants how often they buy poultry meat, what type they buy most frequently, if they buy frozen poultry meat, and where they primarily shop for groceries. It also requests demographic data on age, sex, number of people in their household, and if they live in an urban or rural setting. This information is necessary for secondary analysis, to find demographic themes and patterns in the data. The second component presents four chicken breast products that represent typical choices consumers will find in a grocery store. Each product offers a different combination of production claims (Figure 1; name of store and price identifications were eliminated from the images per IRB approval). Participants were asked to select which package most appeals to them. The

Figure 1. Images for the Screening Survey



third component asks which specific features or attributes of poultry products are attractive to them, selecting from the claims listed in Table 1, with one more option available if they are drawn to the color and design of the packaging. There is a total of 11 choices. Participants indicated which of the options in Table 1 are appealing or not, with a simple yes or no binary question for each option and are not limited to one choice. These binary responses formed the basis for later factor analysis. This structure allowed us to measure key constructs such as purchase behavior, product preferences, and labeling appeal through straightforward questions that mimic real-world shopping experiences. At no point in the survey are participants asked about cost. The screening survey has no price information because it would mislead responses, as at this stage of research we primarily seek to understand the characteristics of packages and not willingness to pay.

Surveys were distributed at four events in North Carolina throughout 2023 (Table 2). We set up poster boards to display images of A, B, C, D, along with IRB approval information and recruiting messages. Participants were asked to participate as they roamed the various events and interacted with North Carolina Cooperative Extension researchers. The participants volunteered to respond to surveys with no financial incentive, and participants could opt out at any time during the survey period. Therefore, this was a more convenient sample than a selected sample. Each questionnaire took 5–6 minutes to complete. No personal identities were recorded. Altogether, 362 surveys were collected across the four events. Participants largely consisted of local actors in the food system from North Carolina and neighboring states, mostly South Carolina, West Virginia, and Virginia. Our participant sample does not represent the average U.S. consumer population, as the convenience sample mostly put us in contact with those directly involved in food systems production and education, who we characterize as highly engaged local food consumers. Reliance on a convenience sampling method does limit the overall generalizability of the survey findings; however, given that this study serves as a screening tool to inform a larger-scale nationally representative survey, we accept this tradeoff at this stage of development. The targeted audience in this survey can still provide valuable insights into labeling perceptions, especially for niche or direct-to-consumer poultry markets. Our national-scale survey will address this limitation by using stratified random sampling to enhance representativeness and allow for broader application of results.

A screening survey that does not use a representative sample is common when the survey is part of a staged sample method. For example, Liang and Dunn (2016) used the method to categorize and analyze multifunctional farms in New England. The project worked with local collaborators to design a screening survey to identify types of multifunctional agriculture activities in New England, such as agritourism, direct sale, value-added operation, and off-farm labor. The rationale for the screening survey in this study is to (1) identify key factors that producers would identify given various production scales and profiles, (2) reduce the burden for consumers to identify factors influencing purchasing decisions not relevant to production decisions, and (3) sort out relevant factors to avoid costly and time-consuming survey procedures. None of these strictly require surveying a representative sample of consumers.

As this sample largely consisted of farmers

Table 2. Events in North Carolina Where Survey Data were Collected

Surveys	Event	Location	Date
1–54	North Carolina Meat Processing Conference	Greensboro, North Carolina	April 6, 2023
55–136	Center for Environmental Systems (CEFS) Field Day	Goldsboro, North Carolina	July 13, 2023
137–207	North Carolina A&T Food Symposium	Greensboro, North Carolina	September 29, 2023
208–362	Carolina Farm Stewardship Association (CFSA) Sustainable Agriculture Conference	Durham, North Carolina	November 11–12, 2023

and individuals directly involved in food system work, the findings are particularly relevant for independent poultry producers not operating under large-scale contracts and who target niche markets for local meat products. These producers often have more flexibility in how they raise, process, and market poultry, and may rely on niche labeling, direct-to-consumer sales, and relationship-based marketing strategies to remain competitive. Thus the survey results offer a snapshot of consumer-facing priorities from the perspective of an audience that is likely already familiar with alternative production practices, which suggests that this market research can support independent operations in making decisions about product labeling, packaging, and messaging that match consumer values related to environmental health and transparency. This study measured stated preference for poultry production claims, but did not include direct measurement of purchasing behavior, such as receipt data or observational tracking. While this is a limitation, the survey was designed to simulate realworld decision-making to capture more realistic responses than abstract questioning alone could do.

Statistical Analysis Methods

Data management and analysis were performed using IBM SPSS 29 statistical software. Descriptive statistics outlined frequencies and general patterns in the data, such as demographic patterns, the most chosen product, and the most favored product attributes. Factor analysis was then used to examine interrelationships in the 11 attribute variables from which participants could choose (the 10 attributes in Table 1 plus the packaging design). The survey was not meant to assess participants' actual understanding of these terms. They were not given definitions or assistance in interpreting each variable's meaning, as we sought to mimic how consumers would assess the variables when making a purchasing decision. By clustering the attributes into similar categories, we can identify common themes across different attributes through factor analysis. Naturally there is overlap between the 11 attributes available for selection, so factor analysis helped determine the underlying factors to create subsets of the independent variables. This is also useful in reducing the number of factors from 11 to a more manageable number to reduce complexity.

Factor analysis has been used in food preference studies with a similar scope to find underlying trends in datasets with many variables (Corallo et al., 2019; Marchioni et al., 2011). Marchioni et al. (2011) used factor analysis to reduce several food group variables into a smaller set of interpretable dietary patterns, which helped summarize dietary habits among their sampled subjects.

We applied exploratory factor analysis to survey participant perceptions of poultry production claims. Each participant was presented with common label claims (e.g., "antibiotic-free," "free range") and asked to indicate whether they found each attribute attractive by selecting either "yes" (coded as 1) or "no" (coded as 0). The resulting binary dataset allowed us to examine patterns of grouping among claims. Extraction for creating factors was based on eigenvalues greater than 1, and rotation coefficients smaller than .45 were suppressed to maintain significance and focus on more meaningful relationships. Eigenvalues were calculated as a standardized way to identify overlap between variables. Kaiser-Meyer-Olkin tests and Bartlett's Sphericity tests were also calculated to verify that the reduced clusters were statistically significantly different. These procedures allowed us to identify coherent and statistically significant clusters of label claims that were commonly grouped together by survey participants. Because exploratory factory analysis is most often applied to continuous data, we recognize the limitation of applying it to binary data. Therefore, our results should be interpreted as a preliminary exploratory clustering pattern, such that other statistical methods may be more applicable for statistical validity, such as using tetrachoric or polychoric correlations to find relationships between binary variables (Holgado-Tello et al., 2010).

Binomial logistic regressions were used to uncover relationships between the identified factors and the sample's demographic subgroups of sex and rural/urban location, while multinomial logistic regression was used to uncover relationships between created factors and the sample's ages. Regression models determined if there was a differ-

ence in consumer preference based on whether the consumer lives in an urban or rural environment, or if there is a difference based on age or sex. In each case, the demographic variables were the dependent variables, and the factors created from the factor analysis were the covariates.

Results

Descriptive Statistics

A total of 362 survey responses were collected; see Table 3 for the demographic summary.

Product B was the most popular product, receiving 206 of the 362 votes (67%) (Table 4). Organic labeling was the most popular choice, with 218 choosing it as a favorable attribute (Table 5). Free Range, Raised and Harvested in the USA, Humanely Raised, Package Color/Design, and Antibiotic Free were the next most popular choices. Vegetarian-fed and No Animal Byproduct were the least commonly chosen options.

Table 3. Demographic Summary of Survey Participants

Sex	Count	%
Male	135	37
Female	227	63
Urban or rural		
Urban	188	52
Rural	174	48
Age		
1–20	14	4
21–40	150	42
41–60	121	33
61+	77	21
Number of people in household		
1	65	18
2	113	31
3	78	21
4	62	18
5+	39	11
Did not respond	5	1
How often do you buy poultry meat?		
More than once a week	79	22
Once a week	136	38
Once a month	106	29
Never	39	11
Did not respond	2	~0
Where do you shop for groceries most of the time?		
Large grocery stores	271	75
Small-/medium-scale stores or farmers markets	79	22
I grow my own	12	3

Factor Analysis

Four components had an eigenvalue of >1, creating four independent factors (Table 6). The Kaiser-Meyer-Olkin score of .692 and Bartlett's Sphericity Test significance score of <.001 indicated the data was sufficiently suitable for factor analysis and that there was strong separation between factors. These results confirm that the underlying assumptions for conducting factor analysis were met, including the size of the sample and the presence of statistically significant correlations between variables. Factor 1 consisted of the following loadings: No Animal Byproduct, Non-GMO, and No Hormones or Steroids. Factor 2 consisted of Organic, Free Range, Raised and Harvested in the U.S., Humanely Raised. Factor 3 consisted of Antibiotic-free and Vegetarian-fed. Factor 4 consisted of USDA-certified and the Color and Packaging Design.

Accounting for the weight of each variable's coefficients in each component, each factor was assigned a generalized factor theme (Table 7). Factor 1 was determined to most closely measure participant preference for "negative labeling," by which we mean attributes framed around the absence of undesirable inputs or practices (e.g., no animal byproducts, no hormones or steroids, no GMOs). Conversely, Factor 2 aligned with preference for "positive labeling," referring to attributes framed around the presence of desirable practices (e.g., raised humanely and organically in the U.S., roaming free range). Factor 3 strongly aligned with preference for an antibiotic-free product. Factor 4 primarily measured attention to the color and design of the package as the main feature that attracted them to buy the product.

Binomial Logistic Regression

Logistic regression models were generated to predict the relationships between the study's inde-

pendent and dependent variables. The choices of independent variables and dependent variables were based on previous studies of consumer behaviors. The independent variables were location, sex, and age (Aklilu, et al., 2007; Vanhonacker & Verbeke, 2009). The dependent variables were the four factors created through factor analysis, not the original 11 attributes. Because sex and age are dichotomous dependent variables with only two categories, and age has more than two categories, different logistic regression models are necessary. Binomial logistic regression was used for age and sex, and multinomial logistic regression was used for age. Binomial logistic regression revealed no significant difference between males and females in likelihood to have a preferred attrib-

Table 4. Assessment of Product Popularity

	Option A	Option B	Option C	Option D	No Response	Total
Total	85	206	49	17	5	362
Male	33	83	13	5	3	137
Female	52	123	36	12	2	225
Chi-Square (*P* value)	.1 (.752)	.403 (.526)	3.214 (.073)	1.549 (.213)		
Rural	45	93	22	11	3	174
Urban	40	113	27	6	2	188
Chi-Square (*P* value)	1.006 (.316)	1.487 (.223)	.186 (.666)	2.093 (.148)		
Age 1–20	3	8	3	0	0	14
Age 21–40	32	92	20	6	0	150
Age 41–60	29	73	13	5	1	121
Age 61+	21	33	13	6	4	77
Chi-Square (*P* value)	.459 (.928)	6.398 (.094)	2.74 (.433)	2.875 (.411)		

Table 5. Assessment of Each Production Claim's Popularity

Variable	Antibiotic-Free	Organic	Free Range	Raised and Harvested in U.S.	Humanely Raised	Vegetarian-Fed	No Animal Byproduct	Non-GMO	No Hormones or Steroids	USDA-Certified	Color and Design of Package
Total	153	218	186	181	172	46	55	69	92	135	181
Urban	83	116	86	92	99	20	31	32	54	69	102
Rural	70	102	92	89	73	26	24	37	38	64	79
Chi-Square (*P* value)	.399 (.528)	.166 (.684)	3.196 (.074)	.241 (.623)	2.846 (.092)	1.306 (.253)	.642 (.423)	1.243 (.265)	2.039 (.153)	.023 (.881)	1.745 (.187)
Male	55	79	64	66	57	14	19	24	32	50	63
Female	98	139	122	115	105	32	36	45	60	85	118
Chi-Square (*P* value)	.829 (.362)	1.008 (.315)	2.56 (.110)	1.396 (.237)	1.186 (.276)	1.308 (.253)	.343 (.558)	.275 (.6)	.570 (.45)	.08 (.777)	1.6 (.206)
Age 1–20	8	7	10	9	9	3	5	2	6	7	7
Age 21–40	72	99	70	85	83	12	19	24	37	66	91
Age 41–60	41	73	67	50	46	16	19	27	33	34	51
Age 61+	32	39	39	37	33	15	12	16	16	28	32
Chi-Square (*P* value)	6.178 (1.03)	5.225 (.156)	4.83 (.185)	7.735 (.052)	9.48 (.024)	7.31 (.063)	5.221 (.156)	1.974 (.578)	3.29 (.349)	7.842 (.049)	9.572 (.023)

ute factor, as the minimum significance value for any of the factors was .146 (as outlined in Table 8). Likewise, participant urban or rural living location was not significant in having a preferred attribute factor (minimum significance value of .239).

Multinomial Logistic Regression

Multinomial logistic regression revealed that age influenced the likelihood of having different factor preferences more than either sex or living location (Table 9). Using an accepted significance of .1, factor 2's significance of .091 finds significance for age as a determinant in favorability towards positive labeling claims. Factor 4's significance score of .006 indicates that age also significantly impacted participants' favorability towards packaging design.

Discussion and Implications

Product B (Figure 1) was by far the most favorable choice, followed by A and C. Interestingly, the attribute labels for Product B were roughly similar to Products A and C. Products A and B both were labeled USDA organic, free range, and raised and harvested in the U.S. Product A had labels for no animal byproduct and no added hormones, which were absent from Product B. Product B was distinct from A in that it had a certified-humane label and was antibiotic-free. Product C also had the following labels: 100% vegetarian fed, no animal byproducts, raised cage-free, antibiotic-free, and no hormones or steroids. While not an option in the survey, several participants noted two extra labeling features on Product B: the "Fair Pay for Farmers" stamp and the "Meet your Farmer" QR code. Some participants also commented that the color of the packaging was more appealing, and the image of the farmer helped create a sense of the chicken having been raised on a family farm rather than a large-scale operation. Product D received by far the least support, receiving only 4% of the votes. Product D has the least number of labeling features compared to the other three products, making no mention of any of the 10 attributes anywhere on its packaging. The only attributes shown are "no artificial ingredients" and "minimally processed."

The most favorable attribute feature was organic labeling, with 60% of participants listing it as something they look for. Similar scoping research tends to affirm that organic labeling is the most ubiquitous

Table 6. Component Matrix after Running Factor Analysis

	Component			
Variable	1	2	3	4
Antibiotic-free			.820	
Organic		.713		
Free Range		.717		
Raised and Harvested in US		.552		
Humanely Raised		.563		
Vegetarian-fed			.557	
No Animal Byproduct	.791			
Non-GMO	.659			
No Hormones or Steroids	.792			
USDA-certified				.467
Color and Design on the Package				.899

Table 7. Explanation of Four New Factors, Based on Their Primary Loadings

Factor	Loading Attributes	Dominant Common Theme
Factor 1	no animal byproduct, non-GMO, no hormones or steroids	Focused on labels with negative connotations associated with animal welfare
Factor 2	organic, free range, raised and harvested in the U.S., humanely raised	Focused on labels with positive connotations and ethics associated with animal welfare
Factor 3	Antibiotic-free, vegetarian-fed	Focused on preference for antibiotic-free
Factor 4	USDA certified, color and packaging design	Focused on attraction to package color and design

food label in terms of what consumers search for besides a product's brand and graphic elements (Gracia & De-Magistris, 2016). However, a significant portion of the population does not pay attention to organic label claims: Drexler et al. (2017) found that in their study of consumer inspection of food product labeling, 27% of participants did not pay attention to or care about organic labeling. Free range and raised and harvested in the U.S. were the second and third most listed attributes, followed by color and design of the package, and humanely raised. Antibiotic-free labeling was the next most common.

Table 8. Results of Binomial Logistic Regression in Examining the Difference in Factor Preference Between Sex and Location

Dependent variable = sex	B	S.E.	Wald	Sig.	Exp (B)
Constant	.485	.111	19.192	<.001	1.624
Factor 1: Negative Labeling	.072	.112	.412	.521	1.075
Factor 2: Positive Labeling	.162	.112	2.112	.146	1.176
Factor 3: Antibiotic-Free	.107	.111	.923	.337	1.113
Factor 4: Package Design	.104	.111	.872	.350	1.109
Dependent variable = location					
Constant	–.091	.107	.726	.394	.913
Factor 1: Negative Labeling	.049	.107	.212	.645	1.050
Factor 2: Positive Labeling	.043	.107	.159	.453	1.044
Factor 3: Antibiotic-Free	–.080	.107	.563	.239	.923
Factor 4: Package Design	–.126	.107	1.385	.394	.882

The three least favorable attributes were non-GMO, no animal byproduct, and vegetarian-fed. This discrepancy appears to demonstrate why Product B was viewed more favorably than Product C. Product B had labeling with the four most popular attributes, but Product C had some of the least popular attributes, such as vegetarian-fed and no animal byproduct, while omitting labeling as to whether the product was organic and was free range or raised and harvested in the U.S. Despite Product C offering labeling with some of the least favorable attributes, it still received much more attention from the participants than Product D, which offered none of the attributes.

Factor analysis was a fruitful way to group the attributes into smaller clusters with similar underlying factors, creating four distinct consumer preference profiles. This is a novel contribution from this research, because the four factors that were created demonstrate natural components into which participants grouped the attributes they value. These preference profiles are valuable because they demonstrate that the instrument could capture meaningful clustering patterns, providing an evidence-based foundation for refining or scaling the survey for future research. Additionally, the preference profiles offer useful insights to small and niche poultry producers to tailor their marketing strategies to the most relevant attribute groupings.

Factor 1 was determined to refer to consumer preference for attributes that make use of "negative labeling" (no animal byproducts, no hormones or steroids, non-GMO), while Factor 2 involves consumer preference for "positive labeling" (organic, free range, raised and harvested in the U.S., hu-

Table 9. Multinomial Logistic Regression Results in Examining the Difference in Factor Preference Between Age Cohorts

Dependent variable = age	B	S.E.	Coefficient Beta	t	Sig.
Constant	2.718	.044		61.389	<.001
Factor 1: Negative Labeling	.044	.044	.052	.991	.323
Factor 2: Positive Labeling	-.076	.044	-.089	-1.696	.091
Factor 3: Antibiotic Free	-.052	.044	-.062	-1.169	.243
Factor 4: Package Design	-.121	.044	-.145	-2.745	.006

manely raised). The distinction between these two labeling structures reflects whether product labels highlight what the product does have, such as free range, or what it does not have, such as non-GMO. Framing labeling structures in this way provides a unique way to understand how consumers may interpret different types of packaging information. Factor 3 was a unique factor that mostly accounted for antibiotic-free preference, suggesting that consumers seeking antibiotic-free products seek this trait in isolation, or not in conjunction with other common attributes. Factor 4 strongly correlated with a heightened valuation of the color and design of the packaging. Because this factor mostly targeted one attribute (despite USDA-labeling also a loading in the factor, but not strongly, with a coefficient of only .467), this suggests that a subgroup of the participants seems to only focus on color and design either in isolation or not in pairing with other common attributes, similar to Factor 3 and antibiotic-free preference. (These factors will be introduced in a national-scale survey.) These preference clusters also connect with the agent-based modeling perspective that asserts that individual decisions, even when simple or binary, can lead to emergent group patterns.

Logistic regression offered possibilities for uncovering how demographic characteristics of the survey sample impacted their preferences. Using binomial logistic regression, the model that was created suggested that there was no significance in the impact of survey participants' sex or living location on preferred attributes. However, a multinomial logistic regression model showed that participant age did appear to impact choices. While studies have already demonstrated a linkage between independent variables such as age, sex, and living location, and perception of food products with enhanced production claims, none have specifically examined these variables in conjunction with a wide range of poultry meat attributes. For example, while several studies linked age as a determinant in support of organic products (Feil et al., 2020), our study broadened the range of consumer choices to include several product attributes, mirroring the actual choices consumers face when buying poultry. Most studies specifically examined consumer preference for select variables in isolation, such as organic (Yadav et al., 2022), antibiotic-free (Jahanabadi et al., 2023), or pasture-raised (Stampa et al., 2022). To our knowledge, we believe this study is the first of its kind to offer participants the many choices they would see in their grocery.

Unsurprisingly, organic was the most popular attribute, as it is ubiquitous in both media and social discourse. The literature suggests that increased awareness and education about food labeling tends to increase popularity and the likelihood of making purchases with the organic label in the grocery store. For example, a study collected participants' valuation of organic poultry meat before and after exposure to educational information on what organic labeling entails; after exposure, nearly 50% of subjects increased their valuation of the same product (Gifford & Bernard, 2010). This suggests a strong relationship between consumer awareness of production claims and the likelihood of pursuing products with these claims in the marketplace.

While research tends to indicate that antibiotic literacy is growing (Bradford et al., 2022), favorability for an antibiotic-free product lagged behind several other production claims. It is unclear whether in this study those who chose not to list antibiotic-free as an important attribute did so because they do not think it is significant or because they don't know about the issue. Despite increasing antibiotic literacy, multiple surveys have found over half of their respondents have limited knowledge about antibiotic use in the food system (Adam & Bruce, 2023). Further research would do well to assess consumer awareness of the production claims presented in this study. Several studies have reached the general conclusion that in many cases the public is either not given enough education about the numerous production claims, or that there is conflicting information which leads to confusion. Both cases lead to declining informed decision-making by consumers (Henryks & Pearson, 2010; Kuchler et al., 2020; Wilson et al., 2020).

Despite our participants not knowing the full extent of products and attributes they were asked to rate, the results provide a snapshot of current consumer behavior. While our screening sample is not broad and scoping enough to directly inform antibiotic policies, exploring consumer attitudes

towards antibiotics and other labeling claims remains a significant avenue for future research. This screening survey precedes larger-scale research, which will be designed with a representative nation-wide sample for informing policies surrounding antibiotic use. Exploring consumer attitudes towards antibiotic use in the poultry products they seek can further inform antibiotic policies and directives, which are currently rapidly changing (Zheng et al., 2025). Consumer attitudes towards antibiotics will also influence the production choices made by producers (Meerza et al., 2022). Furthermore, our factor analysis revealed that some consumers make decisions based on packaging design alone, which is rarely surveyed in food labeling studies. Aesthetic factors matter even among our food-literate sample. Research on the aesthetics and design of poultry meat packaging and how they influence consumer behavior is currently a research gap worthy of exploration.

Because a significant portion of our survey participants are directly engaged in regional food systems, the findings from this study are especially relevant to small and medium-sized poultry producers operating outside of integrator contracts. These producers often rely on direct-to-consumer sales, niche marketing, and transparent labeling to differentiate their products in increasingly competitive markets. The insights presented here can help guide decisions about which product attributes, such as organic, free range, or antibiotic-free, carry the most consumer appeal, particularly among values-driven and health-conscious audiences. Furthermore, this screening survey served to verify the instrument itself. The statistical tests that we used, and the emergence of recognizable factors, indicate that the instrument captured meaningful distinctions among poultry label attributes. However, any generalizations from this research should be within the context of locally engaged producers and consumers who value niche poultry markets.

Findings from this study can also inform how Extension personnel engage with their local communities around food purchasing decisions. Educational materials and public workshops developed through Extension programs could emphasize consumer understanding of poultry product attributes such as antibiotic-free or raised and harvested in the U.S., particularly in settings such as farmers markets, local food hubs, and public health initiatives. Similarly, community-based organizations working to enhance nutrition and food access may benefit from incorporating these insights into their outreach strategies, including nutrition education for families and technical assistance for small poultry producers. These organizations can bridge knowledge gaps by helping consumers navigate the increasing complexity of poultry meat labels.

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