



Phasing out live poultry market trading policy in China: characteristics of chicken consumption, decision-making behavior, and consumer cluster analysis

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Abstract

With the emergence of avian influenza viruses, many Chinese cities periodically close the live poultry markets to restrict the trade of live chicken. This study investigated customers' decision-making clusters and consumption preferences. Data from 1108 participants were collected in May 2021 in the Jiangsu province using a mixed sampling method. Eight decision-making behaviors were identified using the Exploratory Factor Analysis. Five consumer clusters were identified using K-Means Cluster Analysis. Chi-square tests and pairwise comparisons of multiple sample rates were used to identify the differences in consumption preferences between the consumer clusters. The results show that only the concern of risking an avian influenza virus infection might not effectively change consumer preferences towards live chicken and patronage of wet markets and farms. Product quality, consumer habits and loyalty, limited knowledge and technology, and leisure elements in visiting farms are hindering changes in consumer preferences. Effective policies are needed to help customers to overcome the barriers of buying chilled and frozen chicken.

Keywords Live poultry markets · Chicken consumption · Decision-making · Consumer behavior · Chinese consumer · Chicken trade policy

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1 Introduction

Live poultry markets play a significant role in chicken meat supply chains in many countries, including China (Offeddu et al. 2016). The emergence of avian influenza (AI) viruses has put poultry workers and customers at serious risk for infection (FAO 2015). In recent years, chicken meat consumption in China has been rapidly increasing. In 2020, the annual chicken consumption increased by 11.2% to 15.5 m tons; per capita consumption increased by 12.8% to 13.9 kg. The annual chicken meat imports increased by 69.8%, reaching 985,000 tons, and ranked the second-highest in the world (Zhang et al. 2021).

With the emergency of the AI H7N9 subtype in 2013, the live poultry markets (LPMs) were periodically closed in many Chinese cities, and live chicken trade restricted. To avoid the anticipated high risk of virus dissemination (Chen et al. 2020; Yu et al. 2014), the Chinese government enforced a list of policies to encourage people to consume chilled and frozen chickens. Chilled chickens are slaughtered, quarantine approved, quickly cooled to keep the central temperature of the carcass at 0–4 °C, and sold as “fresh”

chickens (Zhao et al. 2019). Frozen poultry gets rapidly frozen after slaughtering and stored in an environment below -18°C . Given that consumption of live chicken has been a traditional habit of Chinese customers (Lin et al. 2017), customer acceptance for the permanent closure of LPMs has been low (Jun et al. 2014; Liping et al. 2014). As a result, LPMs have been in closed-and-resume cycles for a long time. Considering the risk of spreading the AI virus and to protect public health, the Chinese State Administration for Market Regulation has decided to phase out LPMs transactions nationwide in July 2020 without setting a deadline.

In order to cease LPM trades as soon as possible, it is necessary to gain a better understanding of the characteristics of the diverse chicken meat consumption styles and establish specific measures accordingly. Consumer decision-making style is a habitual thinking mode and psychological setting when customers buy goods or services (Sprotles and Kendall 1986). It is a relatively durable behavioral mechanism that may serve as a basis for market segmentation. This study aimed to identify decision-making styles behind chicken meat consumption and consumer clusters using well validated instruments and statistical tools. It also investigated customers' preferences toward different poultry types: live chicken, chilled chicken, and frozen chicken; retail outlets: supermarkets, wet markets (selling live chicken), community convenience stores, rural chicken farms, and online fresh supermarkets.

2 Materials and methods

2.1 Sampling

The Jiangsu province was chosen as the study site for 3 reasons. It has implemented the LPM periodic closing policy. It has a per capita poultry consumption (13.2 kg in 2020) above the national average (11.4 kg per capita) (Liu and Ye 2020) and a higher risk of epidemic outbreaks of AI viruses A H7N9 and H5N1 (Li et al. 2015; Wang et al. 2017). Participants were recruited using a mixed sampling method. The population in Jiangsu was divided into 3 residential areas: northern, central, and southern districts. From each district, 2 cities were randomly selected: Xuzhou and Yancheng from the northern district, Yangzhou and Nantong from the central district, and Nanjing and Changzhou from the southern district. From public areas of each city, 200 urban residents were recruited. Five research assistants were trained before conducting the face-to-face interviews to minimize bias. The interviews lasted for 20–30 min.

2.2 Ethics, consent, and permissions

After getting the ethical approval, the research assistants conducted the interviews from February to May 2021. They explained the research to potential participants and asked for their consent. Those who agreed to participate completed a face-to-face interview using a standardized questionnaire. The questionnaire did not collect any personally identifiable information.

2.3 Study instrument

The questionnaire (Supplementary Material, S1) has 3 sections. The first section collected socio-economic information, including gender, age, level of education, and total monthly household income. The second part of the survey involved a list of 5-point Likert Scale questions (where 1 indicated 'very strongly disagree' and 5 indicated 'very strongly agree'). The Sprotles and Kendall's consumer decision-making style scales (Sprotles and Kendall 1986) were modified according to Chinese thinking, languages, and habitual patterns. Two items for risk perception of AI infection were added. The final scale included 27 items. The third part of the survey involved preferences for chicken product types: live chickens, chilled chickens, and frozen chickens; and chicken meat retail outlets: supermarkets, community convenience stores, wet markets, rural chicken farmers, and online fresh supermarkets. Participants could choose among "never bought one or never patronized" = 1, "bought or patronized once in a while" = 2, "often bought or patronized = 3".

2.4 Data analysis

Three stages of data analysis were conducted. First, Cronbach's alpha (α) coefficient was calculated to assess the internal reliability of the decision-making style Likert Scale questions (Cortina 1993). Then, Exploratory Factor Analysis (EFA) was conducted to identify the underlying relationships and variables between chicken consumption and decision-making behavior, and to determine their underlying factors/constructs. The Kaiser-Meyer-Olkin (KMO) Test was used to measure the suitability of the data for Factor Analysis (Bartlett 1950; Kaiser 1970). The Component Matrix was rotated using the Varimax with Kaiser Normalization method to maximize the sum of the variance of the squared loadings, viz. the correlations between variables and factors. Decision-making style variables with loadings > 0.7 were grouped into decision-making styles which were then named according to the characteristics of the decision-making style variables in the groups, and items

having loading scores < 0.70 were deleted (Hair et al. 2010). Then, the components (factors) with initial eigenvalues > 1 were extracted (Kaiser 1960). Next, an ANOVA analysis of K-Means Cluster Analysis was used to identify poultry meat consumer clusters and their differences (Chantaramanee et al. 2022). The main objective of the clustering method was to identify consumers within the same cluster having similar decision-making behavior but are distinct from other clusters (Table 1). One-way ANOVA of the consumption decision-making style regression factor scores was used to verify the distinctiveness of decision-making characteristics between clusters. Lastly, Chi-square tests and pairwise comparisons of multiple sample rates were used to measure the preferential differences for chicken meat product types and retail outlets among the identified consumer clusters. All analyses were conducted at a 95% confidence level using the IBM SPSS 20.0 software package.

3 Results

3.1 Demographic characteristics of the participants

A total of 1,108 subjects completed the interviews, giving a response rate of 92.3%. There were 92 residents that refused to participate, of which many were aged ≥ 56 years, citing lack of time or other reasons. Among the 1,108 participants, 62.1% were females, 74.7% were aged between 25 and 55 years, and 57.6% had an undergraduate college education or above (Tables 2 and 3). Those with a household income of $>$ Chinese ¥15,001 topped the list, accounting for 33% of the participants. Table 4 shows that 42.1% of the participants often buy live chicken, 8.4% often buy chilled chicken, and 4.7% often buy frozen chicken. Table 5 shows that 44% of the participants often patronize wet markets, 22.1% often patronize supermarkets, and 10.8% often patronize rural chicken farmers. Whereas 4.3% often patronize community convenience stores and 3.0% often patronize online fresh supermarkets.

3.2 Consumption decision-making styles and consumer clusters

The Cronbach's alpha (α) coefficient of the decision-making style Likert Scales was 0.85, indicating a high internal consistency. The KMO Test outcome was 0.81, and the p -value of Bartlett's spherical test was 0.000, indicating the suitability for EFA. Three items having an EFA loading < 0.70 were deleted. For items having EFA loading > 0.7 , 8 chicken meat consumption decision-making behaviors were identified (Table 1):

1. Loyal habitual: repeatedly buying chicken meat products from the same and/or familiar places; and the same type of chicken meat product they like (items 10, 11, 12, and 13).
2. Decision perplexed: not sure where to buy good quality chicken meat products, but price-conscious (items 20, 21, and 22).
3. Casual and recreational: take chicken meat product shopping as a leisure activity (items 4, 5, and 6).
4. Quality priority: take chicken meat product quality as the first priority (items 7, 8, and 9).
5. Trendy and sensitive: sensitive and follow the consumption trends (items 15, and 16).
6. Epidemic cognitive: concerned about the risk of AI virus infection when buying live chickens (items 23, and 24).
7. Time-saving: time-conscious (items 1, and 2).
8. Brand cognition: believe high price and/or brand products have better quality (items 17, and 18).

Based on the ANOVA analysis of K-Means Cluster Analysis, 5 chicken meat consumer clusters were identified (Table 6):

Cluster C1: Characterized by "Loyal habitual" decision-making style, accounting for 20.3% of the participants.

Cluster C2: Characterized by "Decision perplexed" and "Time-saving" decision-making styles, accounting for 23.5% of the participants.

Cluster C3: Characterized by "Trendy and sensitive" and "Casual and recreational" decision-making styles, accounting for 28.1% of the participants.

Cluster C4: Characterized by "Quality priority" and "Time-saving" decision-making styles, accounting for 9.7% of the participants.

Cluster C5: Characterized by "Decision perplexed" and "Epidemic cognitive" decision-making styles, accounting for 18.4% of the participants.

The risk of AI virus infection was not the highest concern to any of the consumer clusters. But it is a significant characteristic of Cluster C5. Customers in Cluster C2 and Cluster C4 shared the "Time-saving" decision-making styles, but customers in Cluster C4 were more time-conscious. Customers in Cluster C2 and Cluster C5 shared the "Decision perplexed" decision-making style, but customers in Cluster C5 were more "Decision perplexed".

Table 1 Exploratory factor analysis scores for chicken meat consumption decision-making styles

Item	Chicken meat consumption decision-making style							
	Loyal habitual	Decision perplexed	Casual and recreational	Quality priority	Trendy and fashionable	Epidemic cognitive	Time-saving	Brand cognition
1. I try shorten the time I spend shopping for chicken meat	0.069	-0.040	-0.012	0.115	0.139	0.194	0.730	-0.072
2. I don't put much thought into choosing chicken meat	0.015	0.105	-0.037	-0.070	-0.080	-0.089	0.812	0.067
3. Shopping for chicken meat wastes my time	-0.002	0.298	-0.197	-0.061	-0.101	0.006	0.677	0.198
4. Shopping for chicken meat is a great way to relieve stress	0.044	0.029	0.834	0.093	0.081	-0.013	0.008	0.122
5. Shopping for chicken meat is a pleasant thing to do	0.079	-0.046	0.898	0.126	0.113	0.036	-0.116	0.017
6. Shopping for chicken meat is a kind of enjoyment	0.077	0.040	0.881	0.125	0.142	-0.036	-0.099	0.004
7. Getting very good quality chicken meat is very important to me	0.202	-0.005	0.070	0.817	0.004	0.125	-0.095	0.030
8. I usually try my best to buy the best quality chicken meat product	0.096	0.000	0.218	0.822	0.141	0.043	0.020	0.079
9. My standards and expectations for the chicken meat product quality are very high	0.207	-0.053	0.087	0.803	0.134	0.155	0.064	0.085
10. I go to fixed places to buy chicken meat	0.716	-0.024	0.070	0.373	0.102	0.080	0.039	-0.040
11. I go to familiar places to buy chicken meat	0.717	-0.078	-0.008	0.384	0.122	0.143	0.031	-0.041

Table 1 (continued)

Item	Chicken meat consumption decision-making style							
	Loyal habitual	Decision per-plexed	Casual and recreational	Quality prior-ity	Trendy and fashionable	Epidemic cognitive	Time-saving	Brand cognition
12. I buy my favorite chicken meat product over and over again	0.841	0.046	0.070	0.100	0.156	0.019	- 0.027	0.103
13. Once I find a chicken meat product I like, I will keep buying it	0.797	0.099	0.079	- 0.035	0.196	0.059	0.073	0.164
14. I can keep up with the chicken meat product consumption trends	0.427	0.210	0.233	0.045	0.621	- 0.074	0.005	0.208
15. I'm interested in the popular ways to eat and prepare chicken meat product	0.254	0.124	0.085	0.120	0.845	0.087	- 0.018	0.124
16. I always pay attention to the latest chicken cooking methods	0.135	0.155	0.171	0.152	0.862	0.023	- 0.015	0.102
17. The higher the price of a chicken meat product, the better the quality	0.102	0.170	0.092	0.087	0.108	0.003	0.030	0.857
18. Branded chicken meat products are the best in quality	0.082	0.149	0.048	0.075	0.172	0.057	0.101	0.833
19. When I buy chicken meat products, price is my first consideration	0.173	0.637	0.123	- 0.133	0.094	0.063	0.063	- 0.028
20. I'm at a loss as to where to buy chicken meat products	0.012	0.799	0.009	- 0.011	0.090	- 0.110	0.109	0.252
21. I often regret my chicken meat buying decisions	- 0.063	0.816	0.068	0.000	0.111	- 0.107	0.051	0.133

Table 1 (continued)

Item	Chicken meat consumption decision-making style							
	Loyal habitual	Decision perplexed	Casual and recreational	Quality priority	Trendy and fashionable	Epidemic cognitive	Time-saving	Brand cognition
22. I really don't know where the best to buy chicken products is	-0.029	0.794	-0.165	0.076	0.075	0.058	0.067	0.041
23. If I buy live chickens during the season of the high incidence of avian influenza, I will be more likely to contract avian influenza	0.072	-0.015	0.000	0.117	0.057	0.909	0.062	0.044
24. People who buy live chickens during the high avian influenza seasons are at increased risk of contracting avian influenza	0.116	-0.051	-0.017	0.169	-0.003	0.902	0.025	0.011

Table 2 The characteristics of participants (n = 1108)

	Characteristic	n	%
Sex	Male	420	37.9
	Female	688	62.1
Age	≤ 25 years	196	17.7
	26–35 years	344	31.0
	36–45 years	237	21.4
	46–55 years	247	22.3
	≥ 56 years	84	7.6
Education	Junior high	128	11.6
	Senior high or technical secondary	342	30.9
	Undergraduate	371	33.5
	Postgraduate or above	267	24.1
Monthly household income (Chinese yuan)	≤ 3000	56	5.1
	3001–6000	199	18.0
	6001–9000	176	15.9
	9001–12,000	217	19.6
	12,001–15,000	127	11.5
	≥ 15,001	333	30.1

3.3 Differences in demographic characteristics and shopping preferences between consumer clusters

3.3.1 Cluster C1

There was a significantly higher proportion of customers in Cluster C1 having postgraduate education or above when compared to Cluster C2 and Cluster C5 (Table 3). Differences in purchasing preferences between customers in Cluster C1 and most other clusters were not significant (Tables 4 and 5). These were consistent with a significantly higher “Loyal habitual” K-means score (Table 6), which might suggest that customers were better informed about where to buy the chickens they like and the chicken qualities, and different individuals might have well-developed specific preferences.

3.3.2 Cluster C2

There was a significantly higher proportion of customers aged ≤ 25 years in Cluster C2 compared to Cluster C4 and Cluster C5 (Table 3). A significantly lower proportion of

Table 3 Chi-square analysis of demographic characteristics of chicken meat consumption clusters

		Cluster, n (%)					Total	χ^2	p-value
		C1 _a	C2 _b	C3 _c	C4 _d	C5 _e			
Sex	Male	81 (36.0)	110 (42.3)	99 _e (31.8)	39 (36.1)	91 _c (44.6)	420 (37.9)	11.40	0.022
	Female	144 (64.0)	150 (57.7)	212 _e (68.2)	69(63.9)	113 _c (55.4)	688 (62.1)		
Age	≤ 25 years	42 (18.7)	64 _{d,e} (24.6)	57 (18.3)	8 _b (7.4)	25 _b (12.3)	196 (17.7)	73.97	0.000
	25–35 years	57 (25.3)	90 (34.6)	100 (32.2)	28 (25.9)	69 (33.8)	344 (31.0)		
	35–45 years	55 (24.4)	46 (17.7)	65 (20.9)	18 (16.7)	53 (26.0)	237 (21.4)		
	45–55 years	58 (25.8)	42 (16.2)	77 (24.8)	30 (27.8)	40 (19.6)	247 (22.3)		
	≥ 55 years	13 _d (5.8)	18 _d (6.9)	12 _d (3.9)	24 _{a,b,c,e} (22.2)	17 _d (8.3)	84 (7.6)		
Education	Junior high	20 _d (8.9)	24 _d (9.2)	28 _d (9.0)	30 _{a,b,c,e} (27.8)	26 _d (12.7)	128 (11.6)	57.74	0.000
	Senior high or technical secondary	56 (24.9)	90 (34.6)	94 (30.2)	26 (24.1)	76 (37.3)	342 (30.9)		
	Undergraduate	71 (31.6)	98 (37.7)	113 (36.3)	28 (25.9)	61 (29.9)	371 (33.5)		
	Postgraduate or above	78 _{b,e} (34.7)	48 _a (18.5)	76(24.4)	24 (22.2)	41 _a (20.1)	267 (24.1)		
Total	n	225	260	311	108	204	1108		

a,b,c,d,e: differences among the indicated values of the particular item were significant at 95% confidence level

Table 4 Chi-square analysis of the chicken product purchasing behavior of different cluster consumers

Product type	Behavior	Cluster, n (%)					Total (%)	χ^2	p-value
		C1 _a	C2 _b	C3 _c	C4 _d	C5 _e			
Live chicken	Never buying	20 (8.9)	26 (10.0)	15 (4.8)	7 (6.5)	22 (10.8)	90 (8.1)	36.45	0.000
	Buying once in a while	100 _b (44.4)	158 _{a,c,d} (60.8)	148 _b (47.6)	42 _b (38.9)	104 (51.0)	552 (49.8)		
	Buying often	105 _b (46.7)	76 _{a,c,d} (29.2)	148 _b (47.6)	59 _b (54.6)	78 (38.2)	466 (42.1)		
Chilled chicken	Never buying	71 (31.6)	88 (33.8)	109 (35.0)	44 (40.7)	58 (28.4)	370 (33.4)	18.26	0.019
	Buying once in a while	141 (62.7)	150 (57.7)	173 (55.6)	62 (57.4)	119 (58.3)	645 (58.2)		
	Buying often	13 (5.8)	22 (8.5)	29 (9.3)	2 _e (1.9)	27 _d (13.2)	93 (8.4)		
Frozen chicken	Never buying	109 _d (48.4)	117 _d (45.0)	149 _d (47.9)	75 _{a,b,c,e} (69.4)	91 _d (44.6)	541 (48.8)	25.35	0.001
	Buying once in a while	102 (45.3)	132 _d (50.8)	147 _d (47.3)	33 _{b,c,e} (30.6)	101 _b (49.5)	515 (46.5)		
	Buying often	14 (6.2)	11 (4.2)	15 (4.8)	0 (0.0)	12 (5.9)	52 (4.7)		
Total	n	225	260	311	108	204	1108		

a,b,c,d,e: differences among the indicated values of the particular item were significant at 95% confidence level

consumers in Cluster C2 often buy live chickens compared to Cluster C1, Cluster C3, and Cluster C4 (Table 4), and often patronize wet markets compared to Cluster C1 and Cluster C4 (Table 5). But a significantly higher proportion of them buy live chickens once in a while compared to Cluster C1, Cluster C3, and Cluster C4. These were consistent with the positive but low “Decision perplexed” and “Time-saving” K-Means scores (Table 1) that young customers were inexperienced and with little budget and time shopping for chicken.

3.3.3 Cluster C3

There was a significantly higher proportion of female customers in Cluster C3 when compared to Cluster C5

(Table 3). A significantly higher proportion of customers never patronize a community convenience store compared to Cluster C2 and Cluster C5 (Table 5). Also, a significantly higher proportion of customers patronize rural chicken farmers once in a while, but a significantly lower proportion of them never patronize a rural chicken farmer compared to Cluster C1 and Cluster C4. A significantly higher proportion of customers often buy live chickens compared to Cluster C2 (Table 4). These were consistent with the high “Trendy and sensitive” K-Means score and the moderate low “Casual and recreational” scores (Table 1) that female customers might be more sensitive to consumption trends and would likely take chicken shopping as a leisure activity.

Table 5 Chi-square analysis of the chicken meat outlet patronage behavior of different consumer clusters

Retail outlet	Behavior	Cluster, n (%)					Total	χ^2	p-value
		C1 _a	C2 _b	C3 _c	C4 _d	C5 _e			
Supermarket	Never patronized	38 (16.9)	40 (15.4)	54 _a (17.4)	25 (23.1)	47 (23.0)	204 (18.4)	18.73	0.016
	Once in a while patronized	140 _e (62.2)	160 (61.5)	191 _e (61.4)	69 (63.9)	99 _{a,c} (48.5)	659 (59.5)		
	Often patronized	47 (20.9)	60 (23.1)	66 (21.2)	14 _e (13.0)	58 _d (28.4)	245 (22.1)		
Wet market	Never patronized	14 (6.2)	23 (8.8)	21 (6.8)	11 (10.2)	26 (12.7)	95 (8.6)	33.28	0.000
	Once in a while patronized	96 (42.7)	140 _d (53.8)	146 (46.9)	34 _{b,e} (31.5)	109 _d (53.4)	525 (47.4)		
	Often patronized	115 _{b,e} (51.1)	97 _{a,d} (37.3)	144 _e (46.3)	63 _{b,e} (58.3)	69 _{a,c,d} (33.8)	488 (44.0)		
Community convenience store	Never patronized	138 (61.3)	136 _c (52.3)	201 _{b,e} (64.6)	65 (60.2)	103 _c (50.5)	643 (58.0)	28.97	0.000
	Once in a while patronized	83 _a (36.9)	114 _a (43.8)	101 _a (32.5)	37 _a (34.3)	82 _a (40.2)	417 (37.6)		
	Often patronized	4 _e (1.8)	10 (3.8)	9 _e (2.9)	6 (5.6)	19 _{a,c} (9.3)	48 (4.3)		
Rural chicken farmers	Never patronized	99 _{c,e} (44.0)	92 (35.4)	97 _{a,d} (31.2)	53 _{c,e} (49.1)	56 _{a,d} (27.5)	397 (35.8)	28.74	0.000
	Once in a while patronized	102 _c (45.3)	144 (55.4)	183 _{a,d} (58.8)	46 _c (42.6)	116 (56.9)	591 (53.3)		
	Often patronized	24 (10.7)	24 (9.2)	31 (10.0)	9 (8.3)	32 (15.7)	120 (10.8)		
Online fresh supermarket	Never patronized	166 (73.8)	162 _d (62.3)	209 _d (67.2)	93 _{b,c,e} (86.1)	137 _d (67.2)	767 (69.2)	37.99	0.000
	Once in a while patronized	57 (25.3)	89 _d (34.2%)	96 _d (30.9)	13 _{b,c,e} (12.0)	53 _d (26.0)	308 (27.8)		
	Often patronized	2 _e (0.9)	9 (3.5)	6 _e (1.9)	2 (1.9)	14 _{a,c} (6.9)	33 (3.0)		
Total	n	225	260	311	108	204	1108		

^{a,b,c,d,e}: differences among the indicated values of the particular item were significant at 95% confidence level

3.3.4 Cluster C4

Compared to other clusters, there was a significantly higher proportion of customers aged ≥ 56 years, and customers at junior high school education in Cluster C4 compared to the other clusters (Table 3). As a high proportion of people aged ≥ 56 years are retired in China, this cluster might be dominated by retirees with low education who might have a more traditional consumption culture. Considering the technology development history in China, these customers might not be very good at using computers and the internet and might be less knowledgeable about chilling and freezing technologies. Unsurprisingly, a significantly higher proportion of them never buy frozen chicken compared to other clusters (Table 4). A significantly higher proportion of them often patronize wet markets compared to Cluster C2 and Cluster C5, and never patronize an online fresh supermarket, whereas a significantly lower proportion of them patronize online supermarkets once in a while compared to Cluster C2, Cluster C3 and Cluster C5 (Table 5). These were consistent with the moderate-high “Quality priority” K-Means score and the moderate-low “Time-saving” score (Table 1). The reason for time-saving could be due to family commitments such as looking after grandchildren, which is common in Chinese culture.

3.3.5 Cluster C5

Demographic differences between Cluster C5 and the other clusters other than those mentioned above were not significant (Table 3). A significantly lower proportion of customers in Cluster C5 often patronize wet markets once in a while compared to Cluster C1, Cluster C3 and Cluster C4. A significantly higher proportion of them often patronize community convenience stores and online fresh supermarkets compared to Cluster C1 and Cluster C3. Uncertainty of where to buy good quality chicken products might shift customers’ attention toward the risk of AI virus infection. It was reflected in the high “Decision perplexed” and moderate-high “Epidemic cognitive” K-Means scores (Table 1).

4 Discussion

This study identified 8 chicken consumption decision-making behaviors and 5 consumer clusters from 1,108 participants. Consistent with previous studies conducted in China (Li et al. 2014; Zhao et al. 2019), this study found that although chilled and/or frozen chickens were better and healthier option to buy than live chicken, especially in the light of the COVID-19 pandemic and the AI epidemic, the acceptance of chilled or frozen chicken was not as high

Table 6 Final chicken meat consumer cluster centers identified based on consumer decision-making style regression factor scores and one-way ANOVA outcomes

Consumer decision-making style	Cluster				
	C1 _a	C2 _b	C3 _c	C4 _d	C5 _e
Loyal habitual	0.860 _{b,c,d}	-0.423 _{a,c,d,e}	0.306 _{a,b,d}	-1.516 _{a,b,c,e}	-0.075 _{b,d}
Decision perplexed	-0.082 _{b,c,d,e}	0.289 _{a,c,d,e}	-0.739 _{a,b,d,e}	-0.607 _{a,b,c,e}	1.170 _{a,b,c,d}
Casual and recreational	-0.553 _{b,c,e}	0.014 _{a,c,e}	0.374 _{a,b}	0.093 _{c,e}	-0.027 _{a,b,d}
Quality priority	0.105 _{b,d,e}	-0.434 _{a,c,e}	-0.127 _{b,d,e}	0.582 _{a,c,e}	0.323 _{a,b,c,d}
Trendy and sensitive	-0.986 _{b,c,d,e}	0.099 _{a,c,d,e}	0.677 _{a,b,d,e}	-0.998 _{a,b,c,e}	0.457 _{a,b,c,d}
Epidemic cognitive	0.128 _{b,e}	-1.162 _{a,c,e}	0.365 _b	0.470	0.535 _{a,b}
Time-saving	-0.068 _{b,d,e}	0.110 _{a,c,e}	-0.164 _{b,d,e}	0.356 _{a,c}	-0.004 _{a,b,c}
Brand cognition	0.017 _{b,c,e}	-0.016 _{a,c,e}	-0.124 _{a,b,d,e}	0.356 _c	0.002 _{a,b,c}
n (%)	225 (20.3)	260 (23.5)	311 (28.1)	108 (9.7)	204 (18.4)

^{a,b,c,d,e}: differences among the indicated values of the particular item were significant at 95% confidence level

among Chinese consumers as anticipated. The proportions of customers buying live chickens and patronizing wet markets remain very high (Tables 4 and 5). This could be due to the fact that the AI epidemic outbreaks in China are under control. Therefore, the risk of contracting AI from wet markets became less of a concern to consumers. Only a low proportion of customers belonged to the cluster characterized by being significantly concerned about the risk of AI virus infection, Cluster C5 (Table 6), which brought about a significantly higher proportion of customers often patronizing community convenience stores and online fresh supermarkets, or a significantly low proportion of them patronizing wet markets. These findings were inconsistent with studies conducted in France and UK, where supermarkets were the most important retail outlets for poultry meat consumption (Walley et al. 2014; Walley et al. 2015). On the other hand, supermarkets were a relatively new phenomenon in China, and farms or wet markets were the only source for chickens not long ago. This difference was reflected in the relatively high proportion of customers who often patronize wet markets and a very low proportion of them often patronize supermarkets and community convenience stores across all the clusters (Table 5). Previous studies identified consumer clusters according to customer perception of quality or sensory characteristics and consumer preferences (Skunca et al. 2017; Sow and Grongnet 2010). Sunca et al. (2017) found that senior customers paid more attention to chicken meat quality. Sow and Grongnet (2010) found that live village chicken was the most preferred and ready-to-cook broiler was the least. This study found that chicken meat quality was a priority to senior customers (Cluster C4) and live chicken were preferred over chilled or frozen (Table 4).

Young customers might have just recently separated from their parent's home and did not have much information and experience in shopping for chicken. They might have busy schedules and other priorities. They were expected to be proficient in using computers and the internet. Therefore,

shopping online might help them get informed and save time. Besides, wet markets might not be the shopping environment and experience that young people are familiar with or enjoy. Lack of knowledge about chilling and freezing technology and internet skills might explain why chilled and frozen chicken, and online fresh supermarkets were significantly less acceptable to senior and quality-conscious customers (Cluster C4) (Hasani et al. 2022; Hati et al. 2021). Self-driving rural tourism in China has become a popular weekend entertainment and is another barrier to phasing out live chicken retailing (Wang et al. 2018; Zou et al. 2014).

4.1 Limitations

This study used a mixed sampling method. It minimized regional bias, but other sampling biases might exist. The effect sample size was 0.13, $\alpha=0.05$, and power=0.95 (Faul et al. 2009). Compared to the population distributions (Textor 2021), customers aged 26–35 years were overrepresented. As these customers were in their golden ages for starting a family, the overrepresentation better reflects the reality. Customers aged ≤ 25 years and customers at undergraduate or above education levels and high household incomes were severely overrepresented (HKTDC 2021). These customers were expected to be proficient in computers and the internet, more informed, have better employment opportunities and conditions, and adopt a more western lifestyle. Customers aged ≥ 56 years and customers at the junior high school education level were severely underrepresented, consistent with the demographic characteristics of Cluster C4. As a result, preferences towards live chicken and wet markets were underrepresented.

“A gentleman should stay away from the kitchen!” is a well-known Chinese cultural norm. It makes the overrepresentation of females in the sample better reflect the reality. Self-reported chicken meat consumption behavior might be different from actual behavior. Both decision-making styles

and consumer clusters were identified from the same sample, therefore subject to the same sampling biases. Hence, self-report biases were of little relevance to the decision-making styles comparison analyses and the consumer clusters comparison analyses. Although this study focused on shopping for chicken meat products, other factors might also affect customers' shopping preferences and practices. For example, a person who wants to buy both live seafood and chicken – live seafood might only be available in wet markets. Wet markets are historical shopping places for chicken in China. There is always a wet market around, but not necessarily a supermarket. This study identified customer decision-making styles and preferences for chicken meat products and shopping outlets. In-depth qualitative investigations to better understand the specific reasons behind them are recommended. This study was conducted in Jiangsu province, other regions in China, and developing and underdeveloped countries may share similar chicken distribution settings (FAO 2015). Globalization also increases cultural convergence especially among the younger generations.

4.2 Implications for practice

This study found that just informing about the risk of AI virus infection might not be sufficient to significantly reduce customers visiting wet markets or farms for live chicken. Concerns about the quality of chilled or frozen chicken meat products, consumer habits and loyalty, knowledge and technology limitations, and the leisure elements in visiting farms might hinder switching consumer preferences from live chicken to chilled or frozen chicken meat products; and from wet markets and farms to other retail outlets. To reduce the risk of AI virus infection, more strategies are needed to shift customers towards chilled or frozen chicken. Therefore, future policies may focus on improving customer perception of the nutritional content, sensory appeal, and the price of chilled or frozen meat (Hati et al. 2021). For example, Śmiecińska et al. (2015) found that the total protein in frozen turkey meat stored for 6 weeks significantly increased, and differences in the concentrations of other chemical compounds (dry matter, fat, minerals, and non-protein nitrogen) were not significant. Promotion could also emphasize the time-saving elements of purchasing chilled or frozen meat from supermarkets (including online fresh supermarkets) and convenience stores. A diverse combination of goods in supermarkets could make shopping enjoyable (Rappaport 2021), especially for female buyers and when the supermarkets are in big shopping malls (Medis et al. 2021). Offering cooked chilled or frozen meat and free tastes in supermarkets and convenience stores could save customers' time for food processing and ensure sensory appeal. Online surfing has been a popular entertainment for the younger generations. Online technology promotion to senior customers

and those with little technical skills could help them enjoy online shopping and improve chilled or frozen meat sales. The methods used in this study could also be employed to analyze other similar decision-making behaviors by modifying the decision-making items as needed.

5 Conclusions

Despite years of periodic closures of LPMs to reduce the risk of AI virus infection, the risk of AI virus infection was not of high concern for most customers. The traditional culture of purchasing live chicken from wet markets stayed firm. Successful changes require changing the status quo (Burnes 2020). More resistance toward chilled or frozen chicken and online shopping was observed among senior customers and those concerned about the chicken meat quality. Effective policies may help these customers better understand the chilling and freezing technology, improve their computer and internet literacy, and discover the benefits of shopping from supermarkets and online, such as through seminars and workshops. Making chilled and frozen chickens available in neighborhood outlets could improve accessibility. Further studies may investigate customers' perceptions of and experience with chilled and frozen chickens, as well as the barriers to switching from live chickens to chilled and frozen chickens to identify further potential intervention leverages.

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Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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