

Factors Affecting Consumer Purchasing Decisions and Willingness to Pay for Oysters in South Carolina

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Abstract

South Carolina oyster producers are looking to expand into other sales channels and need more marketing data to support their efforts. A survey in the South Carolina marketing area (n = 1210) indicates that South Carolina oyster consumers tend to be younger, Caucasian, live in coastal counties, have higher household incomes, and prefer eating oysters at restaurants. Consumers willing to pay higher prices for oysters to eat at home tend to be younger, female, have higher household incomes, and are not Caucasian. Availability, price, and food safety concerns were the top three reasons preventing consumers from buying more oysters at restaurants.

Keywords: oysters, marketing, consumer preferences, willingness-to-pay

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Introduction

According to the U.S. Census of Aquaculture, South Carolina has increased its production of Eastern oysters¹ by more than 250% between 2013 and 2018 (USDA, 2019). This growth continued after 2018, with a recent study indicating an 84% increase through 2019 (South Carolina Sea Grant Consortium, 2021). This increase was mostly due to the adoption of new oyster farming technology—floating cages—which keep oysters in ideal water temperature, salinity, and nutrient content (Holleman, 2018).

South Carolina producers sell more than 90% of their oysters to restaurants, and in typical years there is more demand than supply (Richards, 2020a). However, 2020 was not a typical year. A seismic shock happened when COVID-19 restrictions shut down restaurants, causing South Carolina oyster producers to lose their market overnight (Richards, 2020b; Richards, 2020c; Richards, 2020d). Compounding this problem, South Carolina oyster producers could not quickly pivot from restaurant sales to other marketing outlets. Some producers found limited success with online sales but not enough to cover the cost of operations.

This situation made South Carolina oyster producers realize that they need to diversify their sales channels to mitigate future marketing risk. Because oyster producers sell directly to restaurant buyers, they cannot easily observe retail customer traits. More marketing research is necessary to help oyster producers better understand customer preferences and attract new customers. In addition, collecting data from those who do not eat oysters is essential to determine if any barriers to consumption can be mitigated with different marketing efforts.

Studies for all types of seafood have been conducted both within and outside the United States. Many of these studies focus on seafood labeling: eco-labeling and sustainability certification (Xu et al., 2012; Fonner and Sylvia, 2015; Lim et al., 2015; Carlucci et al., 2017; Brayden et al., 2018; Zander and Feucht, 2018; Hilger et al., 2019; Vitale et al., 2020), food safety claims (Lin and Milon, 1993; Wessels and Anderson, 1995; Shikuku et al., 2020), and seafood source information (Harper, 2015; Nguyen et al., 2015; Dissanayake and Chen, 2016; McClenachan, Dissanayake, and Chen, 2016; van Houcke et al., 2018; Soley, Hu, and Vassalos, 2019). Other studies seek to discover consumer preferences for seafood (Thong and Solgaard, 2017; Kim et al., 2020) and shellfish, including oysters (Batzios et al., 2003; Debucquet et al., 2012; van Houcke et al., 2018).

U.S. oyster consumer surveys have gauged consumer preferences and willingness to pay for oyster branding (Petrolia, Walton, and Yehouenou, 2017), farmed versus wild-harvested (Manalo and Gempesaw, 1997; Kecinski et al., 2017), local versus non-local (Chen et al., 2017; Li, Kecinski, and Messer, 2017; Li, Ahsanuzzaman, and Messer, 2020), and raw versus cooked or processed oysters (Bruner et al., 2014; Li, Kecinski, and Messer, 2017). Some of these studies evaluated where consumers preferred to buy oysters (Love et al., 2020; Bouchard et al., 2021), if they consumed oysters at home or away from home (Herrmann et al., 1994; Zhang et al., 2004; Love et al., 2020), and their reasons for not consuming or not consuming more oysters (Lin and Milon,

¹ *Crassostrea virginica*, Atlantic oyster, American oyster, or Atlantic cupped oyster. An oyster that is native to eastern North America.

1993; House, Hanson, and Sureshwaran, 2003; Zhang et al., 2004). However, to the best of our knowledge, there have been no studies focusing specifically on the southeastern United States.

The southeastern region of the United States is of particular interest because it consistently ranks high in oyster consumption in national surveys (Cheng and Capps, 1998; House, Hanson, and Sureshwaran, 2003; Zhang et al., 2004; Li, Kecinski, and Messer, 2017). One food writer even called the Southeast the “Napa Valley of Oysters” (Niemark, 2016). Despite this fact, there have been no oyster consumer preference studies specific to South Carolina consumers. While South Carolina consumers were undoubtedly included in some of the previously mentioned national surveys (House, Hanson, and Sureshwaran, 2003; Zhang et al., 2004), these studies did not separate single, premium oyster consumption from wild, cluster oyster consumption. Nor was there any need to do this 18 years ago because single-oyster aquaculture production in South Carolina was inconsequential at that time (2005 U.S. Census of Aquaculture) (USDA-NASS, 2006).

South Carolina Oyster Consumer Preference Survey

The data for the study were obtained from an online survey of residents living in the local oyster marketing areas of coastal South Carolina and the zip codes in the metro areas of Greenville, Spartanburg, Charleston, Columbia, and Myrtle Beach. Zip codes from Savannah, Georgia, and Charlotte, North Carolina, were also included, as these metro areas border South Carolina. One reason for choosing this sample area was that urbanization is positively associated with seafood purchasing decisions (Herrmann et al., 1994; Yen and Huang, 1996; Cheng and Capps, 1998; Kow et al., 2008). Qualtrics distributed the survey in August 2020. A total number of 1,210 complete responses were received, consisting of 905 oyster consumers (74.8%) and 305 non-consumers (25.2%).

South Carolina oyster producers and South Carolina Sea Grant Consortium personnel reviewed and pretested the survey instrument. The questionnaire included a set of screening questions that asked if the survey respondent was over 18 years of age, if they live in one of the targeted zip codes, if they are a primary household food purchasing decision maker,² and if they consume single on-the-half-shell oysters (versus the wild-harvested cluster oysters). Also, photographs of single, on-the-half-shell oysters were shown alongside pictures of wild-harvested cluster oysters to avoid confusion between the two. Survey questions relating to locally grown oysters included oysters that were cultivated in South Carolina, North Carolina, and Georgia.

Survey Sample Demographics

Table 1 compares the survey sample demographics with those of South Carolina and the United States as a whole. The survey respondents were younger, more likely to be female, and had higher educational attainment than the United States and South Carolina populations. Survey participants have a slightly higher than average household income for South Carolina but a slightly lower household income than the U.S. average. Respondent household size tended to be a bit larger than the United States as a whole or South Carolina. Non-Caucasians (Black/African American and

² The person(s) who controls the household budget and decides prioritization of regular household expenditures.

other ethnicities) are represented at a higher rate than found in the United States as a whole, but are a close match to the ethnic demographics of South Carolina.

Table 1. Demographics of Sample versus U.S. and South Carolina Populations

	Sample	U.S.	S.C.
Age			
18 to 25 years of age	15.3%	1.5%	1.4%
26 to 34 years of age	28.3%	6.9%	5.7%
35 to 54 years of age	35.7%	29.6%	29.6%
55 to 64 years of age	10.9%	28.1%	27.4%
65 years and older	9.8%	33.9%	35.9%
Gender			
Male	31.2%	49.5%	51.5%
Female	68.8%	50.5%	48.5%
Highest level of education completed			
High school or less	19%	37.3%	43.5%
Some college or associate's degree	36%	27.0%	30.1%
Bachelor's degree	29%	9.8%	16.9%
Advanced degree	16%	3.3%	9.5%
Household income (self reported)			
Less than \$29,999	21.1%	21.1%	32.4%
\$30,000 to \$49,999	22.4%	16.0%	20.3%
\$50,000 to \$74,999	21.7%	16.5%	18.2%
\$75,000 to \$99,999	13.8%	12.3%	11.5%
\$100,000 to \$149,999	12.9%	15.5%	11.0%
\$150,000 or greater	8.1%	18.5%	6.7%
Size of household			
Only me	15.2%	28.2%	34.3%
Two people	32.2%	34.8%	34.4%
Three people	22.1%	15.1%	13.3%
Four people	17.9%	12.7%	10.2%
Five or more people	12.5%	9.3%	7.8%
Race			
White/Caucasian	67.5%	76.5%	68.5%
Black/African American	27.3%	13.4%	27.1%
Other Race	5.2%	10.1%	4.4%

The high female response rate is most likely due to the screening question limiting the survey to those that make household food purchasing decisions. This phenomenon is not uncommon for online survey samples (Smith, 2008; Mulder and de Bruijne, 2019). Respondents who are younger and have higher educational attainment are often included in surveys. Access to the internet may or may not be an issue, with 82.9% of South Carolinians having internet access (U.S. Census Bureau, 2019). However, younger people and those with higher educational attainment tend to

have higher internet speeds and use the internet more frequently (Bethlehem, 2010), likely contributing to the observed differences.

Oyster consumers tended to be Caucasian, possess a higher level of educational attainment, have higher household income, and live in coastal counties. Oyster consumers differed by age, with more non-consumers in the 35–65 age range and more oyster consumers in the 18–34 range. Table 2 compares the demographics of oyster consumer respondents with non-consumer respondents with the results of a Welch's *t*-test on the means of each demographic category. Results are consistent with previous studies, indicating that seafood consumers tend to be younger, with higher income and higher education (Lin and Milon, 1993; Wessels and Anderson, 1995; Cheng and Capps, 1998; Batzios et al., 2003; House, Hanson, and Sureshwaran, 2003; Zhang et al., 2004; Harper, 2015; van Houcke et al., 2018; Quagraine, 2019; Li, Ahsanuzzaman, and Messer, 2020). Gender and household size did not appear to have significant differences between the means.

Table 2. Demographics of Oyster Consumers (n = 905) and Non-Consumers (n = 305)

	Consume (Yes)	Consume (No)	<i>t</i> - test
Age			
18 to 25 years of age	15.5%	14.8%	
26 to 34 years of age	31.0%	20.3%	
35 to 54 years of age	35.2%	37.0%	***
55 to 64 years of age	10.1%	13.4%	
65 years and older	8.2%	14.4%	
Gender			
Male	32.0%	28.5%	
Female	68.0%	71.5%	NS
Highest level of education completed			
High school or less	17.3%	23.6%	
Some college or associate's degree	35.8%	37.4%	***
Bachelor's degree	29.6%	27.5%	
Advanced degree	17.2%	11.5%	
Household income (self reported)			
Less than \$29,999	18.0%	30.2%	
\$30,000 to \$49,999	23.3%	19.7%	
\$50,000 to \$74,999	20.7%	24.9%	***
\$75,000 to \$99,999	14.1%	12.8%	
\$100,000 to \$149,999	14.9%	6.9%	
\$150,000 or greater	9.0%	5.6%	
Size of household			
Only me	15.1%	15.4%	
Two people	32.2%	32.5%	
Three people	21.0%	25.6%	NS
Four people	19.3%	13.8%	
Five or more people	12.4%	12.8%	

Table 2. (cont)

	Consume (Yes)	Consume (No)	t- test
Race			
White/Caucasian	69.8%	60.7%	***
Non-Caucasian	30.2%	39.3%	
Coastal versus inland			
Coastal residency	50.3%	40.3%	***
Inland residency	49.7%	59.7%	

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels.

Results

How Consumers Eat Oysters

Considering that the previous literature provides limited information on how consumers prefer their oysters prepared, the survey participants who consume oysters indicated their preference for oyster preparation (raw, steamed, grilled, or in a recipe combined with other ingredients). The respondents had the option to select all methods applying to their tastes. Figure 1 shows that steamed is the most popular preparation method (70.9%), followed by grilled (48.4%), raw (41.9%), and cooked in a recipe with other ingredients (33.4%).

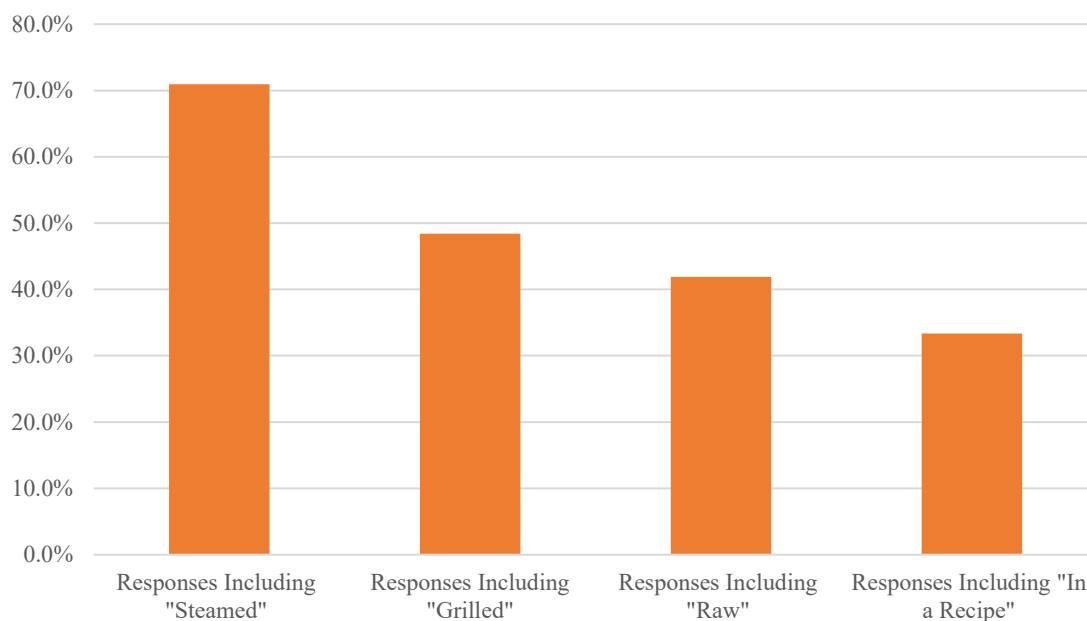


Figure 1. A Summary of All Responses to Preferred Oyster Preparation Methods

Respondents who consume raw oysters were asked further questions about what percentage of their oyster consumption is raw and whether oyster food safety was a concern. This group indicated that they consumed oysters raw 60.2% of the time. By multiplying the incidence of raw consumption (41.9%) by the percent these consumers eat their oysters raw (60.2%), we estimate the size of the raw market to be about 25% of the total local oyster market. In terms of food safety,

more than 73% of raw oyster consumers were either not concerned or only slightly concerned about food safety.

Where Consumers Eat Oysters

For South Carolina oyster producers, it is essential to estimate the sales potential of the at-home market. Survey respondents answered a multiple-response question about where they ate oysters: at home, at a restaurant, or at an oyster roast. Restaurants are the most common locations for eating oysters (74.7%), followed by home (44.5%) and roasts (40.6%). Roast responses are interesting because roasts could potentially occur at home or in a restaurant. An estimate of the size of the home market was reached by questioning at-home oyster consumers (44.5% of respondents) about the percent of oysters they ate at home. The average response was 54.2%, indicating an estimated at-home market size of about 24% (54.2% x 44.5%). This result is precisely the midpoint of the range cited in previous literature (Zhang et al., 2004; Richards, 2020a). To further evaluate the likelihood of home consumption, survey participants responding that they did not eat oysters at home (n = 502, or 55.5%) were asked an additional question: would they consider purchasing oysters to eat at home. Most of these respondents (91%) were willing to consider purchasing oysters to eat at home (65% “Yes” and 26% “Maybe” responses). This response may suggest that the at-home market has the potential to increase from 36% (65% x 55.5%) to 50% (91% x 55.5%) of the away-from-home consumers (see Table 3).

Table 3. Where Consumers Eat Oysters

	Percent
<hr/>	
Where consumed (N = 905)	
Home only	15.4%
Restaurant only	32.9%
Oyster roast only	7.3%
Home and restaurant	11.2%
Home and oyster roast	2.7%
Home, restaurant, and oyster roast	15.4%
Restaurants and oyster roasts	15.2%
Responses including “home”	44.5%
Responses including “restaurants”	74.7%
Responses including “roasts”	40.6%
% consumed at home (if “home” checked)	54.2%
Home responses x percent consumed at home	24.1%
Percent of oysters consumed away from home	75.9%
<hr/>	
Would you consider purchasing oysters for home? (n = 502)	
Yes	64.5%
Maybe	26.3%
No	9.2%
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Willingness to Pay for Oysters at Restaurants and Home

Consumers who eat oysters at restaurants ($n = 676$) were asked about their willingness to pay for local,³ high-quality oysters at a restaurant. Likewise, those who responded that they purchased oysters to eat at home ($n = 403$) were asked about their willingness to pay for local, high-quality oysters to eat at home. Survey participants were presented with a categorical series of possible prices ranging from \$0.49 to more than \$3.00 per oyster for home and restaurant consumption. Figure 2 summarizes the amounts oyster consumers are willing to pay for local, high-quality oysters. The most frequent response (mode) was \$1.49 to \$1.99 per oyster at a restaurant and \$1.00 to \$1.49 per oyster to eat at home.

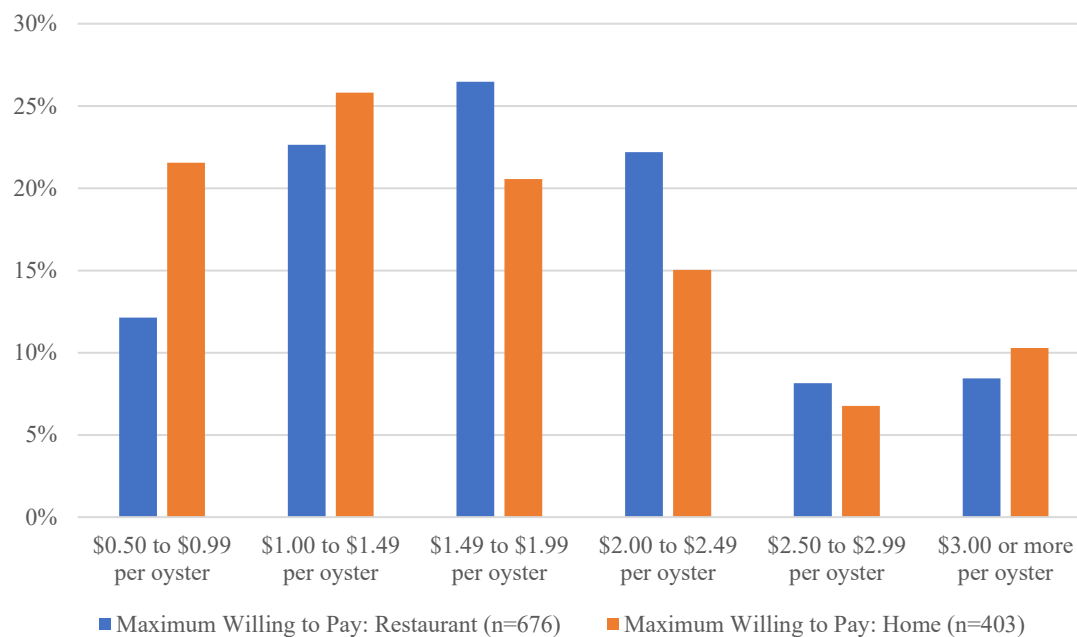


Figure 2. Willingness to Pay for Oysters at Restaurants and Home

Purchasing Barriers at Restaurants, for Home Consumption, and Non-Consumers

One of the main objectives of this study was to discover ways for South Carolina producers to sell more oysters. All oyster consumers ($n = 905$) were asked what obstacles or barriers prevented them from purchasing more oysters. The top two reasons (both 48% of respondents) were the availability of fresh oysters and price. Concern about food safety was the third most common reason (28.8%). Other reasons included restaurants not preparing oysters in the manner the customer prefers, having the ability to try oysters from across the United States (instead of eating only local oysters), and preferring not to purchase oysters in a restaurant (see Figure 3). Those who responded that they did not buy oysters to eat at home were combined with those who stated they would not consider buying them to eat at home ($n = 83$). For this subset of consumers, the dislike of shucking (50.6%), a lack of preparation knowledge (40.7%), and food safety concerns (39.8%) were the top

³ Survey participants were informed that “locally grown” included oysters cultivated in South Carolina, North Carolina, or Georgia.

three reasons. Interestingly, price was nearly the last reason for why these customers did not buy oysters to eat at home (see Figure 4), which highlights the severity of the previously aforementioned barriers and relative uniqueness of shellfish preparation.

Figure 5 shows the responses from 822 consumers who already purchase oysters to eat at home or are willing to consider purchasing oysters to eat at home. These customers were asked about what would encourage them to buy additional oysters to eat at home. Like the restaurant consumer responses, availability (63.3%) and price (50.6%) were the top two reasons, followed by desiring oysters that are pre-shucked (38.4%), having more information on oyster preparation (26.6%), and having the oysters pre-cooked (20%).

The 305 survey respondents who did not eat oysters were asked why they did not consume oysters, whether they were willing to try oysters, and what would encourage them to try eating oysters.

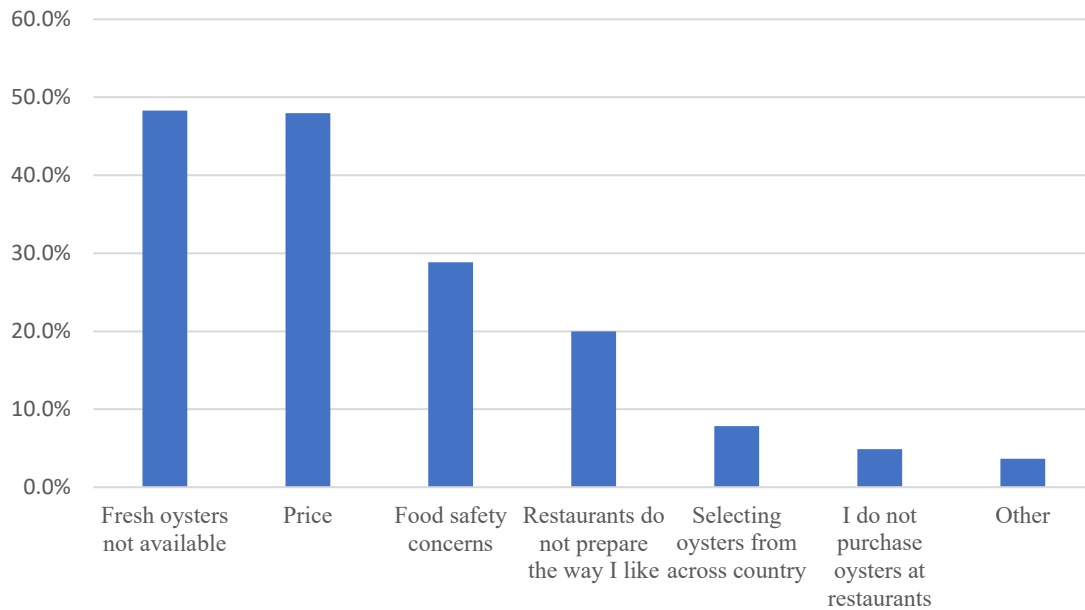


Figure 3. Barriers to Purchasing Oysters at Restaurants

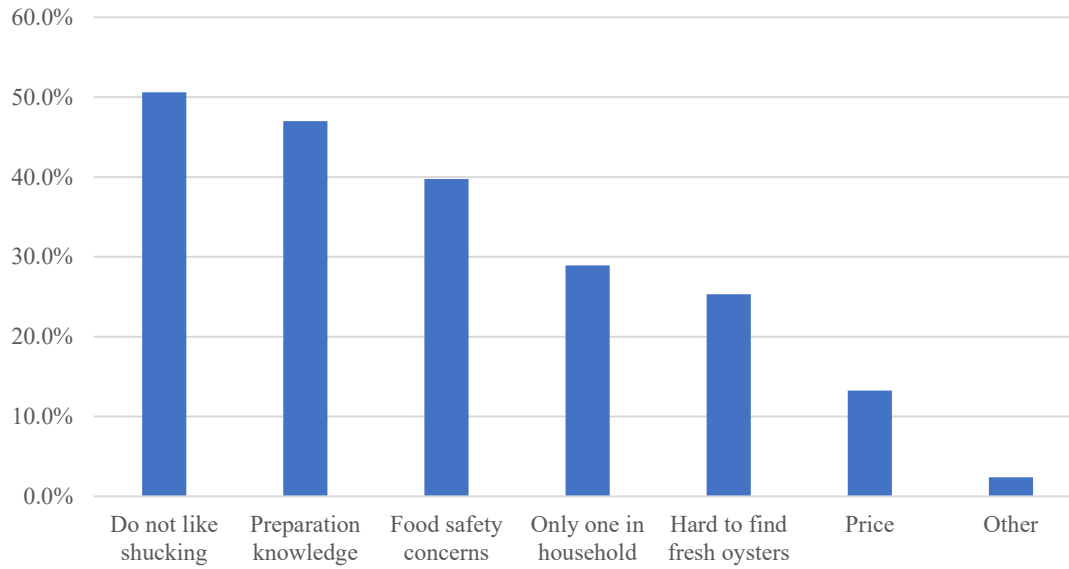


Figure 4. Barriers to Purchasing Oysters to Eat at Home

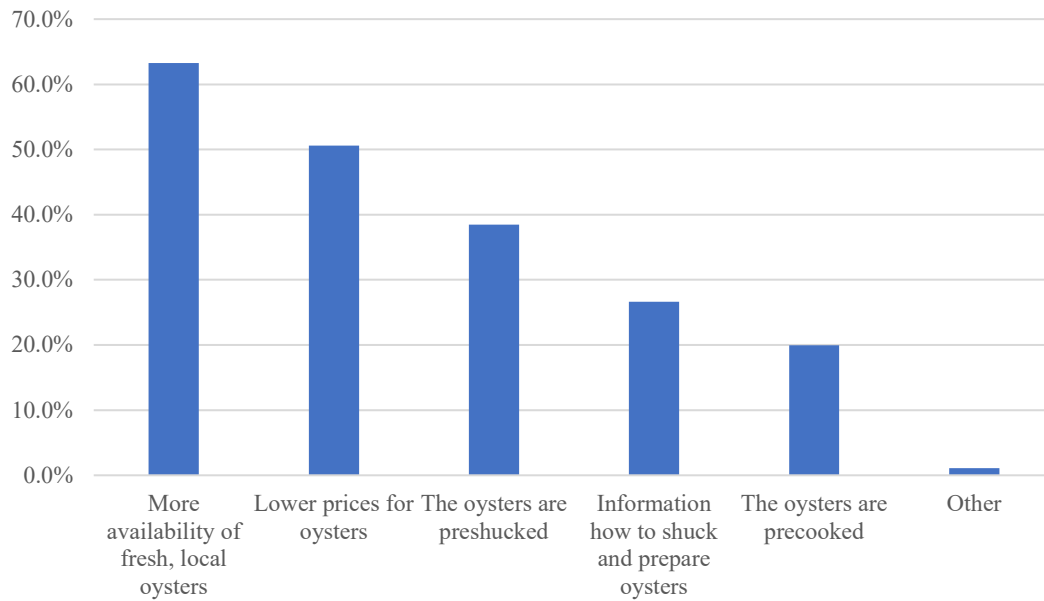


Figure 5. Answers to What Would Encourage More Home Purchases

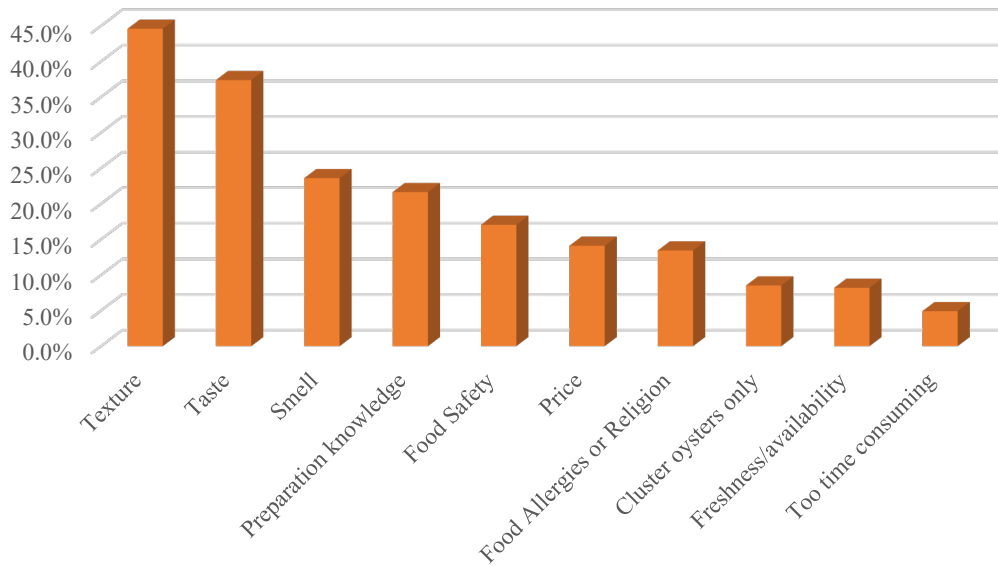


Figure 6. Oyster Non-Consumer Reasons for Not Eating Oysters

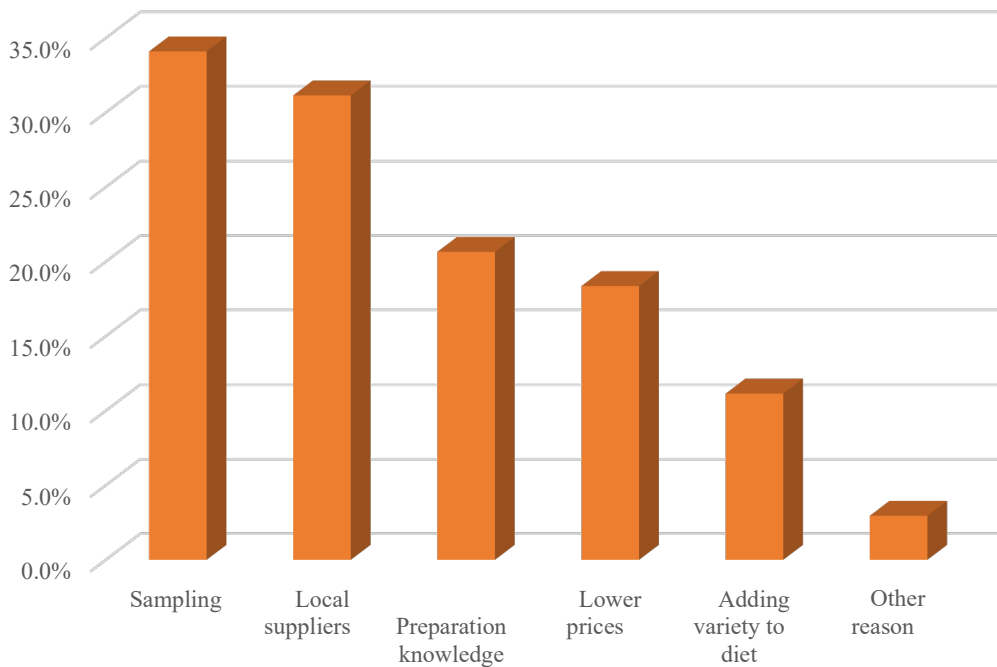


Figure 7. What Would Encourage Non-Consumer to Try Oysters

The reasons for not consuming oysters were texture, taste, smell, a lack of preparation knowledge, food safety concerns, price, allergies, or religion, preferring cluster oysters, freshness and availability, and being too time-consuming to prepare (see Figure 6). In response to whether they would be willing to try eating oysters, 61.3% replied “Yes” or “Maybe.” Those willing to try

oysters believed that sampling oysters, having local suppliers, increased preparation knowledge, lower prices, and adding variety to their diets would encourage them to eat oysters (see Figure 7).

Oyster Attributes and Buying Preferences

Consumers who purchase oysters to eat at home ($n = 403$) were asked to rank important attributes when buying oysters, with “1” being the highest importance and “5” being the lowest importance. The responses ranked, in order, are freshness, size, appearance, cost, and knowing where the oyster was raised. Also, these same consumers were asked about where they preferred to buy oysters. Their preferences (in order) are farmers’ markets, seafood markets, grocery stores, buying directly from the farm, ordering online, and having the oysters shipped to their homes.

As a follow-up question to buying location preferences, consumers were asked if they had a seafood market in their area. Two-thirds of consumers had a seafood market in their area (66.5%). Those that did not have a local seafood market (33.4%) were asked if they would purchase more oysters if a seafood market did exist, and 93.8% replied that they would purchase more oysters. The additional number of oysters these consumers expected to purchase was between 2 to 3 times as much (54.7% and 21.7% of respondents, respectively). Customers were also asked about their willingness to drive (in terms of miles) to purchase oysters. Almost one-third were willing to drive 10 miles, and almost 50% were willing to drive up to 20 miles (see Table 4).

Table 4. Assessing the Importance of a Seafood Market ($n = 822$)

	Frequency	Percent
Do you have a public seafood market in your location?		
Yes	547	66.5%
No	275	33.5%
Would You Buy More Oysters if a Market Existed? ($n = 275$)		
Yes	258	93.8%
No	17	6.2%
How many more oysters would you buy? ($n = 258$)		
More than four times as many	23	8.9%
Four times as many	21	8.1%
Three times as many	56	21.7%
Twice as much	141	54.7%
No additional oysters	17	6.6%
How far are you willing to drive? ($n = 822$)		
Less than 10 miles	265	32.2%
Between 10 and 20 miles	403	49.0%
Between 20 and 30 miles	112	13.6%
More than 30 miles	42	5.1%

Analysis and Models Used

Binomial Logit Regression: Oyster Consumption

Respondents were asked if they consume oysters ($Y = 1$) or do not consume oysters ($Y = 0$). Logistic regression is used to find the probability that a survey respondent will consume oysters ($\Pr(Y = 1)$). The general form of the logistic model is shown below. Logistic regression is also used to find the probability that a survey respondent consumes raw oysters.

$$\Pr(Y = 1) = 1 / (1 + \exp[-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_7 X_7)]) \quad (1)$$

$\Pr(Y = 1)$ = The probability of consuming oysters

X_i = Independent variables (7 demographic and personal characteristics)

β_i = Coefficients of the model, each representing parameters of the model

Ordered Logit Regression: Ranked Responses

Oyster consumers were asked questions about their willingness to pay for oysters to eat at home and in restaurants. Consumers who ate raw oysters were asked what percent of oysters they consumed raw versus cooked. The above response variables are good examples of ranked responses, better analyzed using an ordered logit regression model. For example, suppose Y represents an ordering of responses. In that case, a larger value of Y represents more raw consumption or the willingness to pay higher prices to eat at home and in a restaurant. A general form of the ordered logit model is:

$$\Pr(Y_i = j) = \Pr(\mu_{j-1} < Y_i \leq \mu_j) = \Pr(\mu_{j-1} < [\beta_0 + \beta_i X_i + \varepsilon_i] \leq \mu_j) \quad (2)$$

Y_i = Predicted ranking (consumption frequency or willing to pay higher prices)

$\mu_j = \mu$ is the categorical threshold, with j representing the ranking or cut point

X_i = Independent variables (7 demographic and personal characteristics)

β_i = Coefficients of the model, each representing parameters of the model

ε_i = Random error term

In the analysis, the dependent variable for willingness to pay, WTP^* , is used to model the sequence of the 6 levels of the observed variable WTP separated by 5 cut points, as shown below. In the model, a set of coefficients ($\mu_1 < \mu_2 \dots < \mu_{j-1}$) with $(j-1)$ intercept terms as cut points in the distribution of the willingness to pay choices, representing the threshold values from moving from one category of WTP to another, higher category.

$$WTP_i^* = j \text{ if } \mu_{j-1} < WTP_i^* \leq \mu_j \quad (3)$$

For example, the willingness to pay dependent variable has 6 ordered choices separated by 5 cut points, as shown below. Therefore, the ordered logit regression (Green, 2012) is used to estimate the probability that WTP_i^* lies in one threshold or another. Table 5 summarizes both the dependent and independent variables for these models.

$$\begin{aligned}
 WTP_i &= 1 (\$0.50 \text{ to } \$0.99) \text{ if } WTP_i^* \leq \mu_1 \\
 WTP_i &= 2 (\$1.00 \text{ to } \$1.49) \text{ if } \mu_1 < WTP_i^* \leq \mu_2 \\
 WTP_i &= 3 (\$1.50 \text{ to } \$1.99) \text{ if } \mu_2 < WTP_i^* \leq \mu_3 \\
 WTP_i &= 4 (\$2.00 \text{ to } \$2.49) \text{ if } \mu_3 < WTP_i^* \leq \mu_4 \\
 WTP_i &= 5 (\$2.50 \text{ to } \$2.99) \text{ if } \mu_4 < WTP_i^* \leq \mu_5 \\
 WTP_i &= 6 (\$3.00 \text{ and over}) \text{ if } \mu_5 < WTP_i^* \leq \mu_6
 \end{aligned} \tag{4}$$

Logistic Regression Results

Logistic regression investigated factors affecting the probability of oyster consumption and raw oyster consumption (see Table 6). Regression coefficients for consuming oysters show that Age, Ethnicity, Household Income, and living near the coast significantly affect the probability of oyster consumption. Marginal effects suggest that an increase in age decreases the probability of consuming oysters by 4.9%; an increase in household income increases the probability of consuming oysters by 3.9%; being Caucasian increases the probability of consuming oysters by 7%, and living on the coast increases the probability of consuming oysters by 8.7%.

Table 5. Description of Variables in the Logistic and Ordinal Regression Models

Variable	Description	Response Categories
Age	Age	(1) under 25, (2) 25 to 34, (3) 35 to 44, (4) 45 to 54, (5) 55 to 64, (6) 65 to 74, and (7) 75 years or older
Female	Gender	(1) female and (0) male
Caucasian	Race or ethnicity	(1) white/Caucasian, (0) not white/Caucasian
Education	Educational attainment	(1) high school or less, (2) some college, (3) bachelor's degree, and (4) advanced degree
HHIncome	Household income	(1) Less than \$29,999, (2) \$30,000 to \$49,999, (3) \$50,000 to \$74,999, (4) \$75,000 to \$99,999, (5) \$100,000 to \$149,999, and (6) \$150,000 and greater
HHSIZE	Household size	(1) only me, (2) 2 people, (3) 3 people, (4) 4 people, and (5) 5 or more people
Coast	Lives on the coast	(1) live in coastal county and (0) does not live in a coastal county
WTPHome	Willingness to pay to eat oysters at home	Per oyster: (1) \$0.50 to \$.99, (2) \$1.00 to \$1.49, (3) \$1.50 to \$1.99, (4) \$2.00 to \$2.49, (5) \$2.50 to \$2.99, and (6) over \$3.00
WTPRest	Willingness to pay to eat oysters at restaurant	Per Oyster: (1) \$0.50 to \$.99, (2) \$1.00 to \$1.49, (3) \$1.50 to \$1.99, (4) \$2.00 to \$2.49, (5) \$2.50 to \$2.99, and (6) over \$3.00
Consume	Oyster consumer	(1) consumer eats oysters and (0) consumer does not eat oysters.
Raw	Raw oyster consumer	(1) consumer eats raw oysters and (0) consumer does not eat raw oysters.

Table 6. Logistic Regression: Consuming Oysters and Consuming Raw Oysters

Coefficients	Consuming Oysters			Consuming Raw Oysters		
	Value	Std. Error	Marginal Effects	Value	Std. Error	Marginal Effects
Female	-0.05	-0.15	-0.009	-0.02	-0.15	-0.004
Age	-0.27 ***	-0.05	-0.049	0.10 *	-0.05	0.024
Caucasian	0.38 *	-0.15	0.070	0.59 ***	-0.16	0.134
Education	0.1	-0.08	0.018	0.24 **	-0.08	0.054
HHSize	-0.05	-0.06	-0.009	-0.07	-0.06	-0.015
HHIncome	0.22 ***	-0.05	0.039	0.11 *	-0.05	0.024
Coast	0.49 ***	-0.14	0.087	0.1	-0.14	0.023
(Intercept)	0.85 *	-0.4		-1.83 ***	-0.42	
N	1210				905	
AIC	1309.85				1184.31	
BIC	1350.63				1222.77	

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Regression coefficients for consuming raw oysters show that Age, Ethnicity, Education, and Household Income have a significant effect on raw oyster consumption. Marginal effects suggest that increase in age increases the probability of consuming raw oysters increases by 2.4%; increase in education level increases the probability of consuming raw oysters by 5.4%; increase in household income increases the probability of consuming raw oysters by 2.4%; and being Caucasian increases the probability of consuming raw oysters by 13.4%.

Ordered Logit Regression Results

Ordered logit regression was used to estimate the factors that influence consumers' willingness to pay higher prices. Table 7 shows ordinal regression coefficients concerning willingness to pay for oysters at home and restaurants. Age, Gender (female), Household Income, and Ethnicity (non-Caucasian) are significant variables influencing consumers' willingness to pay for oysters to eat at home. Significant variables associated with willingness to pay at restaurants are Gender (female), Age, and Household Income.

Ordered logit regression was also performed on respondents' stated frequency for consuming raw oysters and consuming oysters at home. Significant variables associated with a higher frequency of raw consumption are Age, Household Income, and Ethnicity (Caucasian). Significant variables associated with a higher frequency of home consumption are Gender (male), Age, Ethnicity (non-Caucasian), and living in a non-coastal location.

Table 7. Willingness to Pay at Home and Restaurants, Raw Oyster Consumption Frequency, and Home Consumption Frequency

Coefficients	WTP: At Home (n = 403)			WTP: Restaurants (n = 676)			Raw Consumption Frequency (n = 379)			Home Consumption Frequency (n = 403)		
	Value/SE	t-value	p-value	Value/SE	t-value	p-value	Value/SE	t-value	p-value	Value	t-value	p-value
Female	0.409 (0.192)	2.13	0.033*	0.2620 (0.152)	1.72	0.085'	-0.1902 (0.190)	-0.96	0.339	-0.5014 (.0.195)	-2.58	0.01*
Age	-0.171 (0.065)	-2.65	.008**	-0.2039 (0.049)	-4.13	.000***	-0.1143 (0.068)	-1.72	0.085'	0.1605 (0.065)	2.47	0.013*
HHIncome	0.119 (0.067)	1.77	0.076'	0.1833 (0.052)	3.52	.000***	0.2489 (0.249)	3.65	.000***	0.0473 (0.068)	0.69	0.487
HHSize	-0.068 (0.074)	-0.93	0.353	0.0070 (0.058)	0.12	0.903	-0.0489 (0.049)	-0.64	0.524	0.0329 (0.073)	0.45	0.650
Caucasian	-0.439 (0.200)	-2.20	.028*	-0.0513 (0.166)	-0.31	0.757	0.8510 (0.851)	3.57	.000***	-0.3869 (0.196)	-1.97	0.048*
Education	0.163 (0.104)	1.56	0.118	0.0795 (0.081)	0.98	0.326	-0.1756 (0.176)	-1.58	0.115	-0.0957 (0.104)	-0.92	0.356
Coast	-0.262 (0.185)	-1.41	0.157	-0.1166 (0.142)	-0.82	0.410	-0.0963 (0.096)	-0.50	0.616	-0.4165 (0.186)	-2.24	0.025*
Intercepts:												
	Value	Std. Error	t-value	Value	Std. Error	t-value	Value	Std. Error	t-value	Value	Std. Error	t-value
1 2	-1.0845	0.5031	-2.1559	-1.4820	0.4188	-3.5391	-2.3391	0.5916	-3.9536	-2.7408	0.5106	-5.3672
2 3	0.1514	0.4995	0.3032	-0.0762	0.4141	-0.1839	-1.0084	0.5737	-1.7577	-1.5071	0.4977	-3.0282
3 4	1.0490	0.5028	2.0860	1.0585	0.4164	2.5417	0.1564	0.5702	0.2743	-0.5247	0.4924	-1.0656
4 5	1.9131	0.5108	3.7450	2.2437	0.4228	5.3073	0.9219	0.5723	1.6109	0.3395	0.4918	0.6904
5 6	2.5095	0.5202	4.8239	3.0162	0.4324	6.9749						
	Residual Deviance: 1336.305			Residual Deviance: 2249.001			Residual Deviance: 1118.12			Residual Deviance: 1260.338		
	AIC: 1360.305			AIC: 2273.001			AIC: 1140.12			AIC: 1282.338		

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; ' $p < 0.1$

Marketing Implications

Logistic regression results indicate that oyster consumers, in general, tend to be younger, live in a coastal county, are likely to be White/Caucasian, and have higher household incomes. Age tending to be younger is encouraging, as it indicates the consumer base has potential to grow, considering millennials (those 24–39 years of age in 2020) are America’s largest generation (Fry, 2020). Coastal county residency may be significant due to proximity, allowing for greater availability and product freshness (the top-ranked attribute in the survey for purchasing oysters).

The raw oyster market commands the highest premium in South Carolina. This seems to be the case elsewhere in the United States (Botta et al., 2021) and may be the most valued way of marketing oysters overall (Petrolia, Walton, and Yehouenou, 2017; Kamiyama and Takahashi, 2019). Variables associated with raw oyster consumption are somewhat different from those of the general oyster consumer, suggesting that raw oyster consumers tend to be older, are White/Caucasian, have higher household incomes, and have higher educational attainment. Raw consumption associated with older age groups may be partially explained by a high number of younger individuals (18–25 years) reporting that they did not eat raw oysters. Still, there appear to be more instances of older individuals reporting that they eat raw oysters in the dataset. European studies of oyster consumption explain that eating them raw is a traditional method (Debucquet et al., 2012; van Houcke et al., 2018). House et al. (2003) found that U.S. oyster consumers tended to be older as well. However, the most likely explanation may be found in the analysis of raw oyster consumption frequency. Ordered logit regression results found that those who eat raw oysters more frequently tend to be younger, have higher household income, and are Caucasian (see Table 7), consistent with other age-related oyster consumer traits in this study.

Food safety does not appear to be a concern for raw oyster consumers in this study. In contrast, general oyster consumers cited food safety as the third most common barrier to purchasing more oysters at restaurants and at home. However, consumer sentiment changes about food safety and raw consumption, especially during oyster recalls (Dowell et al., 1995; Shieh et al., 2007; McIntyre et al., 2012). Oyster producers dependent on selling their oysters solely for raw consumption would be wise to have alternative marketing channels or post-harvest oyster processing technology available. Oyster producers may also be well served by promoting their growing methods, which have been shown to produce safer oysters (Canty et al., 2020).

Consumer willingness to pay for oysters generated some noteworthy results. The willingness to pay question was posed to respondents as the maximum they would be willing to pay per oyster at home and restaurants. When considering this fact, it appears that a sizeable portion of restaurant consumers may have indicated they are not willing to pay market prices for locally raised oysters, which are priced between \$2.00 and \$3.50 on most South Carolina restaurant menus (Richards, 2020a). These findings are not specific to South Carolina either, as a recent restaurant menu meta-study reports that average menu prices for oysters in the United States also fall within this range, with the Southeast commanding the lowest average menu price (Botta et al., 2021). This study suggests that willingness-to-pay results are generally applicable to the southeastern United States but may not be applicable to other parts of the United States with respect to oyster prices. On a

positive note, for those who buy oysters to eat at home, most respondents are willing to pay current South Carolina local oyster prices, which are in the range of \$1.00 to \$1.49 each (Richards, 2020a).

Ordered logit regression indicated a higher willingness to pay for oysters to eat at home and was accompanied by a likelihood that the consumer is younger, female, has higher household income, and is not Caucasian. Consumers who had a higher willingness to pay for oysters at restaurants were more likely to be female, younger, and have a higher household income. These findings reinforce observations in the literature that the restaurant consumer may have different traits or attributes than the home consumer (Herrmann et al., 1994; House, Hanson, and Sureshwaran, 2003). Heterogeneity of oyster consumers is not a new finding, either. For example, a study in Delaware (Li, Kecinski, and Messer, 2017) found that fried oyster consumers differed considerably from those consuming oysters prepared in other manners. Discovering which preparation methods are preferred for home consumption would be a good topic for future study.

While the at-home market is a small piece of the total oyster market (24%), the lessons of COVID-19 and restaurant shutdowns underline the importance of understanding this group of oyster consumers and potentially increasing the at-home oyster market. The survey results show that at least 65% of those who do not eat oysters at home are willing to try it. Factors encouraging these consumers to buy oysters to eat at home include increased availability, lower prices, pre-shucked oysters, and more preparation knowledge. Price and availability concerns were less important factors for those unwilling to consider purchasing oysters to eat at home, with a dislike of shucking, a lack of preparation knowledge, and food safety concerns being more critical barriers.

The three most preferred attributes when buying oysters are freshness, size, and appearance. Interestingly, the cost of the oysters and where they were cultivated ranked fourth and fifth. One explanation for cost appearing lower in this ranking (versus price in other questions in the survey) may be that freshness, market size, and acceptable appearance are prerequisites to the purchasing decision before price is considered. Where the oysters were raised ranking last disagrees with some of the local food literature. This result may have been encouraged because respondents already considered the oysters to be local based on other questions in the survey. However, there have been studies that show that a generic “local” label may generate a higher willingness-to-pay response than seafood products labeled with a precise location (McClenachan, Dissanayake, and Chen, 2016; Li, Ahsanuzzaman, and Messer, 2020). These findings may encourage collaborative marketing efforts among local producers, where promotional efforts can focus on local origins versus producer and site-specific origins.

Preferences for where to buy oysters showed that farmers’ markets were first, followed by seafood markets and grocery stores. Buying at the farm and ordering online were the least preferred options, which may disappoint producers desiring to sell directly to the consumer. It appears that more seafood buying points might be a better strategy, with most survey respondents replying that they would buy 2 to 3 times more oysters if a seafood market existed in their area. Furthermore, as respondents point out, they would like these buying points to be close by, less than 20 miles away. As an extension of this research, ArcGIS mapping of zip codes collected from survey respondents will be used to identify potential locations for seafood buying points in South Carolina.

Finally, this study aimed to assess what marketing efforts might encourage non-consumers to eat oysters. Respondents' top reasons for not eating oysters were taste, texture, smell, a lack of preparation knowledge, and food safety concerns. These reasons are like those found in House et al.'s study (2003), where the authors pondered whether trying to reach non-consumers was worth the effort. To answer this question, non-consumers in this study were asked if they would be willing to try oysters and what would encourage them to do so. Sampling, local suppliers, and increased preparation knowledge were the top three responses. Oyster sampling may be a way to gain new consumers, and it has been observed that local suppliers encourage non-consumers to try seafood (Richard and Pivarnik, 2020). It may also be worthwhile to encourage younger people (in the 18–25 age range) to sample raw oysters to build that market for the future.

Conclusions and Limitations

South Carolina has substantially increased its oyster production over the past decade. Despite these productivity gains, South Carolina oyster producers have limited knowledge about the characteristics of oyster consumers. This study is an effort to cover this gap in the literature. To the best of our knowledge, this is the first study that addresses oyster consumers and non-consumers, their demographic traits, consumption patterns, and willingness to pay in the South Carolina marketing area.

Limitations to this research include capturing other methods of oyster preparation and actual oyster consumption volume. This study focused exclusively on single, premium oyster preparations and did not determine the total number of oysters each demographic group consumed. Other limitations of the survey included separating the barriers to consumption or purchases based on prior responses and consumption locations, limiting data modeling options. Future research could focus on these topics and questions related to expanding oyster marketing efforts to non-Caucasians, inland consumers, and retailers other than restaurants. Additional research concerning oyster attributes, both pre-purchase and post-purchase, would also provide beneficial information for oyster marketing.

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