


Goat Meat Consumption in Oklahoma: A Quantitative Assessment of Potential Consumer Demand

Nirodha De Silva^a, Wesley Whittaker^b, and Benaissa Chidmi^c

^a*Assistant Professor, Department of Agricultural and Natural Resources,
701 Sammy Davis Jr. Drive, Langston University,
Langston, OK 73050, USA*

^b*Professor, Department of Agricultural and Natural Resources,
701 Sammy Davis Jr. Drive, Langston University,
Langston, OK 73050, USA*

^c*Associate Professor, Department of Agricultural and Applied Economics,
2500 Broadway, Texas Tech University,
Lubbock, TX 79409, USA*

Abstract

Although goat meat is one of the significant meat protein sources around the world, it is a minor consumption item in the United States. However, with dynamic demographic integration throughout the country, consumption has increased in recent years, while domestic goat meat supply has not kept pace with consumer demand. Using a Qualtrics survey, the study assesses potential factors influencing the demand for goat meat consumption in Oklahoma. The results indicate that gender, education, income, price specials, and safety assurance measures influence goat meat demand. These findings will help execute an effective market expansion strategy for goat meat in Oklahoma.

Keywords: goat meat, consumer survey, marketing strategies, probit model, marginal effects

[Ⓞ]Corresponding author:

Tel: (405) 466-6163

Email: nirodha.de_silva@langston.edu

Introduction

Goat meat is a vital source of protein for meat consumers in the world marketplace. According to the United States Department of Agriculture (USDA) food composition database (USDA-NAL, 2019), goat meat is lean meat, which is relatively healthier in nutritional qualities than other red meat. Recently, the demand for goat meat has increased in the United States. According to USDA statistics, the total goat inventory in the United States in January 2023 was 2.51 million goats, a 2% decline from 2022 (USDA-NASS, 2019). Based on available data, the United States does not produce an adequate supply of goat meat to satisfy local demand (Ekanem et al., 2013). This shortage leads to a relatively high price for goat meat in the United States. The U.S. imports goat meat mainly from Australia to fill the supply gap (USDA-ERS, 2020).

Several studies show that the main driving forces for the increased demand for goat meat in the United States are the increased consumption from ethnic groups and the rising awareness about healthy dietary habits (Knight et al., 2006; Ibrahim et al., 2017). As ethnic diversity is highly associated with goat meat consumption, it will eventually lead to unique preferences among U.S. meat goat consumers. In addition, previous studies found the demand for goat meat among the target consumers to be inelastic (Pinkerton, David, and Pinkerton, 1992). Ibrahim et al. (2017) report that the majority of goat meat consumers in the United States have cultural ties with the Middle East, Latin America, the Caribbean, and Asia. As the population of ethnically diverse Americans is projected to increase by 17% in 2040 (Colby and Ortman, 2015), the demand for goat meat in the United States will increase as the population increases, *ceteris paribus*.

At the production level, Oklahoma ranks fourth in meat goat inventory in U.S. goat production (USDA-NASS, 2019). However, goat producers in Oklahoma are constrained by marketing issues and seasonality in goat meat prices (Jones and Raper, 2017). This uncertainty will lead to yield, marketing, and other risks to producers and the market.

As with other commodities, meat goat production and marketing are highly correlated. Pinkerton, David, and Pinkerton (1992) emphasized insufficient marketing information on seasonal demand, consumer opinions, and consistent quality (Knight, 2005). In this scenario, understanding the dynamics of goat meat consumption and its implications is vital for producers and marketers in better responding to consumers' tastes and preferences. A practical question involves identifying the factors that will increase the consumer's willingness to pay for and consume goat meat. Specifically, what are the product attributes and demographics responsible for shaping consumers' willingness to consume and pay for goat meat? On the other hand, assessing consumers' willingness to consume and pay for goat meat helps to determine investment and production capacity planning, production allocation, and sales by building marketing strategies for expanding the goat meat market in Oklahoma. In addition, the outcome of this identification is vital in advertising and promotional activities to increase the display of goat meat in supermarkets.

A promising feature of goat meat is its source of nourishing benefits. Goat meat provides less saturated fat, lower calories, and less cholesterol than traditional meats, including chicken, beef, pork, and lamb. Regarding saturated fat, goat meat contains 0.79 saturated fat per 3 ounces when

compared to a similar serving size of chicken (1.7g), pork (2.9g), beef (3.0g), and lamb (2.9g). While goat meat provides 122 calories per 3 ounces, beef and pork provide 179 calories and 180 calories for a similar serving size (Niyigena, 2020).

These nutrition attributes represent an opportunity to expand the market for goat meat in the United States. As consumers become more aware of the health benefits of goat meat, the demand for low-fat red meat will eventually rise.

Our paper investigates the product attributes and consumer characteristics that affect the likelihood of goat consumption in Oklahoma. Specifically, the study attempts to identify the numerous product characteristics and the consumers' demographics and socioeconomic factors influencing consumers' willingness to consume and their buying decisions across different counties in Oklahoma. The study also identifies helpful market strategies for marketers, grocers, and retailers that can attract goat meat consumers for their meat products.

Previous Studies

This section provides a brief overview of the changes in the U.S. goat meat market, consumer attitudes and preferences, and potential factors contributing to the rise in the demand for goat meat. Few studies have been conducted focusing on goat meat consumption. Ibrahim et al. (2017) explore the factors affecting the potential demand for goat meat in Georgia. The authors use a binary logit model to estimate the willingness to consume goat meat and find that the education, gender, and household size of the respondents are statistically significant determinants of the willingness to consume goat meat. Importantly, this study shows that around 56% of the respondents who did not previously consume goat meat stated that they would purchase goat meat if they could find goat meat products from nearby grocery stores. Their study also finds that the freshness attribute is statistically significant in increasing the likelihood of consuming goat meat, and 94% of respondents expressed that freshness is an important feature of purchasing decisions. This result implies a better positioning for local goat production over imported and frozen goat meat products. According to the survey results, nutritional qualities, including leanness and cholesterol content, are also shown to be very important in consumer choices.

Ekenem et al. (2013) studied the profiles and goat meat consumer preferences using the data from face-to-face interviews administered in Tennessee. The survey identified that 62.2% of the interviewed meat consumers were immigrants, and 83% of the participants purchased goat meat. In addition, their analysis reported that 32.1% of the consumers stated they were willing to pay a higher price for goat meat, but 85% of the buyers responded that price was an important determinant in purchasing decisions. Moreover, the results showed that taste, package, and nutrition instruction were also important factors, with 84%, 75%, and 58% of participants choosing them as essential attributes.

McLean-Meyinnse (2003) investigated the socioeconomic, demographic, and geographic characteristics that result in the willingness to try and purchase goat meat products using the data across states in the United States. The study employed binary logit and ordered probit models to

estimate the factors affecting prior consumption and the probability of willingness to consume goat meat from non-goat meat consumers, thereby providing valuable estimates on future buying decisions of consumers for different goat meat products. Their results indicated that goat meat consumption was at the top for older customers, households consisting of more than three members, African Americans, non-Caucasians races, men, and Texas households. The study's findings also illustrated those women and residents, including Arkansas, Florida, Kentucky, Louisiana, North Carolina, South Carolina, Oklahoma, and Virginia, would be more likely to eat goat meat in the future. The study further concluded that age, race, household size, religion, gender, and residence affected goat meat consumption.

Another study by Harrison et al. (2013) implied that meat cuts, source of meat, and price were comparatively more critical than the goat meat color. This analysis used survey data from 2,000 general respondents and 2,000 goat meat consumers. For the live goat buyers, the slaughtering method and the goat's age were also more significant compared to the price and sex of the goat. The study concluded that various marketing opportunities would be available for goat meat producers in selling goat meat products and live goats.

Degner and Lin (1995) examined consumer perceptions and preferences by analyzing the willingness to consume goat meat at different locations through a blind taste test. Consumers were questioned about various sociodemographic features and about consuming at home and in a restaurant. The study emphasized consumers' views and attitudes toward goat meat. Consumers responded that if goat meat was prominently advertised, there was a higher probability that those consumers would order goat meat at restaurants. Among the selected socioeconomic and demographic factors, income, gender, and household size were identified as statistically significant factors for goat meat consumption in this study. The study further found alternative product names for goat meat products, cooking techniques, and meal attributes of the whole pack provided by the food outlet.

Research conducted by Knight et al. (2006) detailed the sociodemographic factors on goat meat consumer preferences. According to this study, among the age categories, individuals between the ages of 45 and 64 are the most likely to have consumed goat meat in the past, while younger consumers stated that they would like to consume it. In addition, males are more likely to express the desire to buy goat meat than females. The research focused on three categories: non-consumers (consumers who are unwilling to consume goat meat), potential consumers (consumers who are willing to consume goat meat), and current consumers (consumers who consume goat meat). Results reported that Hispanics were more likely to eat goat meat compared to Black Americans in all three categories. The findings also suggest that consumers with professional or graduate degrees are more likely to purchase goat meat. The same study also found that lamb consumers were more likely to consume goat meat. Several studies (Worley et al., 2004; Ibrahim et al., 2008; Fisher et al., 2009) reported that consumers were willing to add goat meat in place of lamb. The findings of Knight et al. (2006) further indicated that consumer attitude about goat meat is a significant obstacle in deciding their choices regarding goat meat. The findings revealed that consumers whose views toward goat meat were positive were more likely to be classified as goat meat consumers. Although there has been considerable demand for goat meat due to the rise in

ethnic variety, the study emphasized that increasing supply is necessary to fulfill the increasing demand. Considering that this study demonstrates that there is no difference in the willingness of Black and White purchasers to consume goat meat, it would be important to expand into new and existing markets outside of the non-Hispanic and non-Black markets. Additionally, Knight et al. (2006) also highlighted the importance of raising consumer awareness of goat meat's health and nutritional benefits; therefore, educational information can positively impact consumer decisions.

Liu, Nelson, and Styles (2013) investigated potential factors affecting the purchasing decisions of goat meat consumers and showed a considerable possibility of increasing the demand for existing consumers. The study also identified latent demand for new consumers and a seasonally adjusted demand. According to the study, older consumers and ethnicity were significant determinants of goat meat consumption, and age significantly affected willingness-to-purchase decisions.

Finally, Martin (2021) addressed the effect of consumer perceptions and demographic factors on their willingness to purchase goat meat. This research used a national survey to illustrate the impact of the various consumer attributes on grass-fed, locally produced, and organically raised goat meat. The results implied that the meat quality and freshness variables significantly affected consumers' willingness to buy goat meat. Furthermore, the analysis suggested that there is a possibility for a good market potential for fresh goat meat products.

Methodology

Data Collection: Survey

Data were collected using consumer surveys across 77 counties in Oklahoma to characterize and understand consumer preferences for goat meat and identify other potential factors that influence goat meat demand. The sample was identified through Qualtrics Panels, LLC, and was also used to conduct the survey. Potential respondents were contacted via email by Qualtrics and provided the opportunity to participate in the online survey. The survey was approved by Langston University's Human Research Protection Program. The electronic survey was administered between July and August 2021, and a total of 508 households responded. The survey instrument gathered detailed information on several categories of questions, including sociodemographic, economic, and other factors potentially influencing goat meat consumption from participants 18 or older from the 77 counties in Oklahoma. The primary research question of the survey questionnaire was to determine the consumers' willingness to consume goat meat.

Data Description

This study is based on the reviewed literature, and prior research indicates that the probability of purchasing goat meat is influenced by a variety of factors, including gender, age, education, household income, ethnicity, price specials, safety measures, and specific meat cuts. Tables 1 and 2 present the selected profiles of goat meat consumers and important survey responses of consumer buying behaviors. Table 1 also summarizes the sociodemographic information. Hence, we learn from the survey that 68.1% of the respondents are female, 70.4% are white, 9.4% are African

American, 5.8% are Hispanic, and 10% of the survey respondents identified themselves as multiracial.

Table 1. Selected Profile of Goat Meat Consumers

Demography	Percent	Count	Demography	Percent	Count
Gender			Education		
Male	31.89%	162	High school or less	38.38%	195
Female	68.11%	346	Some college	32.48%	165
Age			College graduate	22.44%	114
18–29 years	42.32%	215	Postgraduate/prof	6.69%	34
30–49	43.50%	221	Household Income		
50 years and older	14.17%	72	Less than \$10,000	13.19%	67
Race			\$10,000–\$24,999	16.73%	85
White	70.40%	352	\$25,000–\$49,999	28.35%	144
African-Amer/black	9.40%	47	\$50,000–\$99,999	28.15%	143
Black	2.80%	14	\$100,000 or more	2.95%	39
Hispanic	5.80%	29	Prefer not to answer	5.91%	30
Asian	1.60%	8			
Multiracial	10.00%	50			

There were six categories of educational achievements, with 38.3% of the respondents having either a high school diploma or lower, 32.48% having some college education, and nearly 6.7% having a postgraduate degree. Among the 508 participants, 73.3% said they would purchase goat meat if it were accessible in their grocery stores, and 26.7% responded that they were not interested in the product. While 24.6% of those surveyed had previously consumed goat meat, 75.4% had not. Among the participants who had already consumed goat meat, those between the ages of 18 and 29 expressed the most willingness to eat goat meat again, and those in the age category of 30 to 39 were the next highest willingness group among those who have consumed goat meat. On the other hand, among those who had eaten goat meat, participants who were 50 and 59 years old said they were most unlikely to consume goat meat again. Additionally, 48% of participants stated that cooking instructions are important, while 49% replied that prepackaged cuts are vital in their buying decisions.

Consumer Buying Behaviors, Opinions, and Specific Cut Preferences

Table 2 reports some important information on consumer buying behaviors along with attitudes and preferences for goat meat. According to the survey, 38.4 % responded that the participant or any member of the participant’s household had purchased goat meat, whereas 61.6% answered they had not. At the same time, 72.2% of the participants preferred purchasing specific goat meat cuts, including chops and cubes, and 11.8% expressed buying live goat (to be slaughtered). When considering specific cuts, most consumers preferred chops—approximately 39.9%—while 12.5%, 5.9%, and 4.7% of the respondents stated that they purchased cubes, whole carcasses, and half carcasses, respectively. When questioned about how much they preferred each cut of meat, 47.2%

of participants selected “very much” for chops on a scale that ranked consumer opinions and perceptions of the specific meat products. Approximately 43.2% of the consumers were likely to travel less than 1 mile from home to the farm where they buy live goats. Regarding where the respondents purchase goat meat, 17.82% bought it from the farm.

In this study, we aimed to identify the potential factors influencing the decision to purchase goat meat from Oklahoma consumers. Both socioeconomic and demographic factors were identified, and various goat meat product attributes of consumers’ buying decisions were also assessed.

The dependent variable in this study is a “yes” or “no” response to whether consumers are willing to consume goat meat. Therefore, we apply a discrete choice probit model for the dichotomous binary variable to provide a detailed analysis of the consumers’ behavioral responses to the consumer preferences questions regarding goat meat consumption.

Table 2. Some Information about Consumer Buying Behavior

Information	Percent (%)
Purchased goat meat	38.4
Specific cuts	
Chops	39.9
Cubes	12.5
Whole carcass	5.9
Half carcasses	4.7
Consumer opinions for specific cuts	
“Very much” for chops	47.2
“Very much” for cubes	13.8
Travel distance to purchase goat meat	
Less than 1 mile from home to the farm	43.2
Purchasing location	
Farm	17.8
Buying goat meat if it is available in food stores	73.3
Cooking instructions are important	48.0
Prepackaged cuts are important	49.0

The larger the value of y_i^* , the greater the individual’s utility received from choosing the option $y_i = 1$; the greater the probability of choosing the option. The researcher does not observe y_i^* but observes the choice according to the following expression:

$$y_i = 1 \text{ if } y_i^* > 0 \quad (2)$$

$$y_i = 0 \text{ if } y_i^* \leq 0,$$

A description of the explanatory variables can be seen in Table 3.

Table 3. Probit Model Variables and Description

Variant	Variable name	Description
Gender	GENDER	1 if female, 0 otherwise
Age	AGE1	Ages 18 to 29 (omitted category)
	AGE2	Ages 30 to 39
	AGE3	Ages 40 to 49
	AGE4	Ages 50 to 59
	AGE5	More than 60
Education	EDU1	Less than high school (omitted category)
	EDU2	High school diploma
	EDU3	Associate's/technical degree
	EDU4	Some college
	EDU5	College graduate
	EDU6	Postgraduate/professional
Decision to purchase goat meat Price specials	PRVIM	1 if very important
	PRIM	1 if important
	PRNIM	1 if not important (omitted category)
Safety assurance	SAFTY1	1 if very important
	SAFTY2	1 if important
	SAFTY3	1 if not important (omitted category)
Ethnicity	BLACK	1 if Black, 0 otherwise
	HISP	1 if Hispanic, 0 otherwise
	WHITE	1 if White, 0 otherwise (omitted category)
Household income	HH1	Less than 10,000 (Omitted category)
	HH7	\$75000 to 99,900
	HH10	\$200,000 or more
	HH11	Prefer not to answer

According to Greene (2017), we express the probit model:

$$\begin{aligned}
 p_i &= \text{prob}[Y_i = 1|X] \int_{-\infty}^{x_i'\beta} (2\pi)^{-1/2} \exp\left(-\frac{t^2}{2}\right) dt & (3) \\
 &= \Phi(x_i'\beta)
 \end{aligned}$$

where Φ is the standard normal cumulative distribution function. The maximum likelihood estimation is employed to obtain the parameter estimates of the binary probit model. In addition, the marginal effect provides the change in the probability or measures the change in probability

due to a unitary change in one of the explanatory variables under the *ceteris paribus* condition. The marginal effect of a variable x_k is given (Greene, 2017):

$$\frac{\partial p_i}{\partial x_{ik}} = \phi(x_i' \beta) \beta_k \quad (4)$$

where ϕ denotes the probability density function of the standard normal variable.

Empirical Results and Discussion

The fully specified empirical model for this analysis is based on Equation 1. Table 4 provides the results of the binary probit model with the estimated coefficients, standard errors, and marginal effects with other goodness of fit statistics. According to the study's results, respondents' education, gender, household income, price specials, and safety assurances, such as USDA inspections of goat meat, significantly affect consumers' willingness to purchase goat meat. On the other hand, our results show that age and ethnicity variables have no statistically significant effect on the consumers' goat meat consumption.

In the model, the gender variable has a positive and statistically significant effect on the probability of purchasing goat meat. In addition, the marginal effect indicates that males are 13% more likely to consume goat meat than females. On the other hand, the variable for the education level of college graduates is positive and significant at the 10% level. The marginal effect of education implies that individuals with a university/college degree are 14.6% more likely to buy goat meat than individuals with less than a high school-level education. This finding is likely because education increases individuals' awareness of healthy food and nutritional values. Our findings align with Knight et al. (2006), who reported statistically significant and positive coefficients for the education variable for willingness to consume goat meat.

Table 4. Empirical Results from the Willingness-to-Consume Goat Meat

Binary Probit Model				
Parameter	Estimate	Standard Error	Pr > ChiSq	Marginal Effects
Intercept	-0.8681	0.3268	0.0079	-----
GENDER	-0.4394**	0.2010	0.0288	-0.1337
AGE2	-0.2903	0.2219	0.1907	-0.0883
AGE3	-0.3302	0.2759	0.2314	-0.1004
AGE4	0.0711	0.4087	0.8619	0.0216
EDU2	0.0133	0.1420	0.9254	0.0040
EDU3	-0.0963	0.3289	0.7697	-0.0293
EDU4	0.2159	0.2693	0.4227	0.0657
EDU5	0.4819*	0.2790	0.0842	0.1466
EDU6	0.1737	0.4136	0.6745	0.0529
PRVIM	1.0027***	0.2629	0.0001	0.3051
PRIM	0.4327***	0.1359	0.0015	0.1316
SAFTY1	0.5597**	0.2327	0.0162	0.1703
SAFTY2	0.2234*	0.1232	0.0698	0.0679
BLACK	0.0836	0.1627	0.6072	0.0254
HISPANIC	0.1220	0.0879	0.1652	0.0509
HH7	-0.3879	0.2741	0.1570	-0.1608
HH10	-0.4596*	0.2649	0.0828	-0.1180
HH11	-0.5737	0.3830	0.1342	-0.1398
HH1	-0.5285	0.3885	0.1737	-0.1745

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

Moreover, the results indicate that household income level variable (HH10) for the income level of \$200,000 or more is a statistically significant factor in the analysis. The probit model results show that household income negatively influences the willingness to consume goat meat. Hence, the respondents with more than \$200,000 annual household income are approximately 12% less likely to buy goat meat than consumers who earn an income less than \$10,000. This finding illustrates the lower willingness of buyers to consume goat meat as household income increases, suggesting a negative income elasticity of demand. Further, it is possible, given that other things

are equal, people tend to substitute their consumption of goat meat with other closely related goods when their income increases.

Another important result is the significance of price specials in increasing the likelihood of consuming goat meat. In effect, there are 30% more chances to buy goat meat when individuals view the price specials as very important than those who think price specials are unimportant. According to the responses from the consumer survey, 13.75% of the participants answered that goat meat is more expensive than other traditional meat. The study illustrates that price specials are essential to meat purchasers and would increase their likelihood of trying goat meat, given that it is expensive compared to other meat types. Among the buyers, 30% are more likely to rank price specials as a “very important” strategy than the shoppers who viewed them as “not important.” Overall, around 43% are highly likely to believe price specials are helpful promotional tools to enhance goat meat consumption when the consumers view price specials as “very important” and “important” compared to who did not answer price specials as “not important.”

Finally, safety assurance is one of the critical determinants affecting consumers’ buying decisions. The study’s findings reveal that safety assurance, such as USDA inspection, is a significant factor in purchasing goat meat. The mean marginal effect of safety assurance suggests that the probability of buying goat meat increases by 17% when consumers view safety assurance as very important, and by 6% when they rank it as “important.” This is an increase over those consumers who did not answer that safety measures were important.

Conclusion

The demand for goat meat has increased in the United States, indicating potential for market expansion. This study was conducted to identify the socioeconomic factors that affect consumers’ willingness to consume goat meat. Understanding the dynamics of goat meat consumption and its implications is critical to assessing the potential economic impact on Oklahoma’s goat meat marketing and production sector.

The study found that socioeconomic factors, such as education, gender, price specials, and safety measures, influence goat meat consumption and purchasing decisions. To expand the goat meat industry, providing educational information is helpful as there is a higher probability of more informed buyers consuming goat meat. Our survey results revealed that consumer awareness of the nutritional value of goat meat was low. Although goat meat is high in protein, low fat and low cholesterol, and has other health benefits, many people are misinformed about these attributes. Therefore, informational campaigns would be essential to enhance the consumption of goat meat. Higher educational levels increase individuals’ decision making and likelihood of consuming highly nutritional foods to mitigate health concerns. As indicated by Knight et al. (2006), it is crucial to increase consumer understanding of the health and nutritional benefits of goat meat, and educational information may positively influence consumer decisions.

The study found that the probability of purchasing goat meat is higher for males than for females. Females are the primary shoppers in family grocery spending, mainly concentrating on the price

and quality of food and meals (Chopra, 2014). Therefore, marketers can promote goat meat using those strategies to attract female customers. Consumers show positive reactions toward price specials; this variability increases the probability of goat meat buying decisions. Therefore, offering price specials would be a crucial marketing strategy. Thus, food stores and marketers may provide various price specials during the year to influence buying decisions. According to the survey respondents, goat meat is more expensive when compared to other traditional meats. Hence, a price special that reduces the unit price may lead to an increase in quantity demanded by an amount greater than the reduction in the unit price, resulting in a rise in overall sales and revenues.

Although previous research suggests that Blacks and Hispanics are the major goat meat consumers, this study found that ethnicity did not significantly impact goat meat consumption. Therefore, the goat meat industry should also focus on non-Black and non-Hispanic markets as there is no difference in the willingness of Black and White consumers to consume goat meat. This result may reflect the increasing integration of ethnic groups into the mainstream demographics of Oklahoma and the United States, suggesting that marketers should focus on all consumers and all ethnic groups, which could create opportunities to explore the entire goat meat market beyond ethnic populations. Consequently, the study suggests that market expansion is possible. The goat meat industry should focus on an educational campaign about all aspects of the product, without regard to demographic groups. Additionally, if goat meat products are sold as prepackaged cuts with cooking instructions and promoted as a healthy alternative to other meats, consumers will likely be encouraged to purchase them regularly.

Marketers and producers can use the results of this study to understand their consumers better and the characteristics consumers desire in goat meat, which will help increase the markets for goat meat in Oklahoma. Additionally, this research emphasizes the requirement for further research into how consumer comprehension of the nutritional value of goat meat could lead to higher consumption. Marketing strategies focusing on goat meat's nutritional value and health benefits may facilitate market expansion.

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