THE THIN LINE BETWEEN TRADITION AND WELL-BEING: CONSUMER RESPONDS TO HEALTH AND TYPICALITY ATTRIBUTES FOR DRY-CURED HAM

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1. Introduction

Consumers generally perceive traditional foods as high-quality products, but at the same time, they are increasingly looking for healthier, more nutritious, and affordable products (Azzini et al., 2018; Guiné, et al., 2021). The trend to innovate has also made its way to "traditional" products, such as dry-cured ham, which is prepared using a long-established method (Azzini et al., 2018; Rabadan, 2021). Italian dry cured ham, long recognized for its taste and production technique, is currently adapting its processes to match novel consumer expectations (Kühne, et al., 2010), just as the entire meat sector has done for years (Verbeke, et al., 2010; Miller, 2020; Gaspar et al., 2022).

Consumer meat product preferences worldwide have shifted consumption patterns (Neff et al., 2018; Cheah et al., 2020; García-Gudiño, et al., 2021) and are causing the meat industry to innovate. For dry-cured hams, the demands are many and often at odds: healthy, traditional (e.g., PDO-certified), flavourful, reduced in fat and salt, and reduced or free of additives (Font-i-Furnols and Guerrero, 2014; de Andrade et al., 2018)

Additive compounds, which produce many of these preferred sensory features, have displayed harmful health effects and negatively influenced consumer choice (Merlino et al, 2018; Di Vita et al., 2022). Nitrites, nitrates, and sodium chloride have all been linked to negative health effects (Sebranek and Bacus, 2007; Flores and Toldrá, 2021). Salt (NaCl), which is particularly high in cured ham (Matthews and Strong, 2005), is known to cause hypertension and linked to cardiovascular disorders (Kameník, et al., 2017). All three of these additives, despite recommendations that they be limited for a healthy diet, are indeed currently contained—at varying levels—in dry-cured hams, even those having Protected by Designation of Origin (PDO) certification (Martuscelli, et al., 2015.).

1.1 Study background, objective and research questions

Within this context, several factors that drive consumer meat quality expectations have yet to be fully identified and ranked, let alone their interrelationships explored. Furthermore, consumer acceptance for innovation in traditional products, such as Italian dry-cured hams, remains largely unexplored (Mancini and Consiglieri, 2016). Technological innovations have been tested in several traditional agro-food products (Grunert et al., 2011; Guiné, et al., 2021; Carlucci et al., 2022), but scant attention has been paid to consumption of those innovative products linked to traditional production and human health. This has made some consumers sceptical of traditional product innovation when it is linked strictly to health characteristics.

The need to preserve tradition during rising demand for healthier cured meat products prompted us to explore the relationship between health-related attributes and the typicality of traditional dry-cured ham. Our underlying question asks whether a perception change in some attributes (such as nitrate-free, low salt content, or quality) leads to a rank ordering of PDO dry-cured ham preferences.

This study aims to provide empirical evidence on how the cured meat PDO certification could evolve to meet consumer preferences to safeguard their health. To this end, a ranking conjoint analysis based on a linear assumption may help to assess the trade-off between traditional and health attributes to inform product innovation to meet consumption pattern changes. This method is a useful marketing tool based on random utility theory (Roe et al., 1996) belonging to multi attribute evaluation methods (Popovic et al., 2018)

The objectives emerging from this study background are the following: measure consumer attitudes toward cured ham in terms of utility for geographical indication and healthy attributes; determine if a convergence exists between homogeneous consumer groups; identify any socio-demographic characteristics associated with the quality attributes considered. Three questions frame this research:

1. Is there a hierarchy to consumer preferences among the attributes investigated?
2. Which is the more important attribute: labelled geographic indication, healthiness, or price?
3. Are there well-established market niches for low-salt and -nitrate traditional dry-cured ham?

Relative to previous approaches (de-Magistris and Gracia, 2016), this study is novel as it incrementally and jointly evaluates different consumer preference claims. The conjoint analysis-based methodology also allows evaluation of the trade-off and relative importance between health attributes (salt and nitrites) and traditional (origin) (Di Vita et al., 2021a). This novelty extends current knowledge by permitting different claims, some related to different attributes, to be evaluated in a multi-claim milieu. In particular, insights will afford practical evidence about the relevance of labelled dry-cured ham together with recommendations for specific action to stimulate strategic marketing actions.

2. Literature Background

As expected, consumer attitudes and preferences that influence their expectations for cured hams quality (Balogh, et al., 2016; Garavaglia, and Mariani, 2017). Overall opinions are quite heterogeneous and vary on psychological, sensory factors and quality standards (Caracciolo, et al., 2010; Gaspar et al., 2022). Existing literature specifies the major consumer preference attributes: salt content (Petit et al., 2019; Schivazappa and Virgili, 2020), nitrite and nitrate content (Aoki et al., 2010; Hung et al., 2016a;), fat content (Ventanas, et al., 2007; Merlino et al., 2018), place of origin

(Garavaglia and Mariani, 2017; Merlino et al., 2018), price (Mesías et al., 2009; Gaspar et al., 2022) Finally also socio-demographic features in dry cured ham preferences were analysed (Resano et al., 2012; Mendoza et al., 2014).

2.1 Nitrites and nitrates

The effects of nitrite chemistry on cured product properties have not been exhaustively studied. Unsettled issues related to consumer perceptions of quality and safety (Sebranek and Bacus, 2007; Shan et al., 2016; Petit, 2019; Flores, and Toldrá, 2021) are relevant to the dry-cured ham seasoning process. The sodium and potassium nitrite and nitrate salts used not only enhance meat colour and flavour, but also limit microbial activity (Sindelar and Milkowski, 2012; Mortensen et al., 2017). These positive nitrite effects and consumer trends must both be considered because their interaction is complex as borne out in the following studies.

In 2010, Aoki et al., reported that consumers had a negative opinion of sodium nitrite regardless of a full exploration of its effects. The study found most consumers chose nitrite-free ham over ham containing nitrites. However, once informed of the positive flavour imbued by nitrites, many experimental participants opted for the ham containing nitrites. Furthermore, when consumers were provided a free ham sandwich, they were less affected by the health risk information linked to nitrites (Aoki et al., 2010). Dangerous risks to human health from these compounds has created a negative awareness of chemical additives (Hung er., 2016a; Hung et al., 2016b). Hung and Verbeke (2018) also demonstrated that meat products with lower nitrite levels are recognized by consumers in terms of sensory aspects. A recent study of processed meats and consumer preferences found that nitrite content was deemed the second most important attribute in cured meats (Di Vita et al., 2019a). Di Vita et al. (2019b) also underlined the rising preference for reduced additives in salami and corroborated the growing consumer focus on health-promoting products (Hung et al., 2016a).

Consumer dislike of added nitrites arises from a limited understanding of nitrite use in meat products. However, consumers do agree that substituting nitrites with phytochemical-containing additives is preferable because they are perceived as natural and healthy (Hung et al., 2016a). In fact, Sindelar et al. (2007) showed that substituting powdered vegetable juice for nitrites in cured ham can produce sensory qualities similar to those of traditional ones. Furthermore, when compared with other additives, nitrite reduction is difficult given their multiple functions (Hung et al., 2016a). However, innovation in the production and curing practices of processed meats has led to a gradual reduction in the levels of nitrites used (Sebranek and Bacus, 2007). As the demand for additive reduction grows, it may represent a differentiation strategy for the processed meat industry (Toldrá and Reig, 2011).

2.2 Salt content

The fact that exaggerated sodium consumption can increase the risk of hypertension (Law, 1997) has resulted in the exploration of consumer acceptance and preference for cured meats with low salt content (Desmond, 2006). Consumers, women in particular (Guàrdia et al., 2006; Morales et al., 2013), have shaped the strong preference for lower sodium or "clean-labelled" foods, such as those without additives (Petit et al., 2019). However, trending preferences are not always straightforward. For example, higher product expectations are generated for those containing lower sodium than for those of higher salt content (Hersleth et al., 2011; Schivazappa and Virgili, 2020). The sensory differences linked to changes in salt content are well documented (Andres et al., 2004; Benedini et al., 2012; Škrlep et al. 2016). Butchers clearly state that a salty taste is one of the principal factors affecting consumer purchase decisions today (Morales et al., 2008). Kim et al. (2021) found that a reduction in salt content may actually negatively affect taste expectations for meat products.

From the marketing perspective, while lower salt improves the nutritional profile of raw ham, consumers also show an increasing acceptance for its inclusion (Schivazappa and Virgili, 2020). Labels indicating reduced salt in meat products seem to have either limited relevance (de Almeida et al., 2017), or none in the case of cured ham (De Magistris et al., 2021). Consequently, consumer preferences for reduced salt content need further exploration and evaluation.

2.3. Geographical Indications and Origin designation

Consumer behaviour and preference for PDO-labelled and traditional cured meat products has been deeply investigated (Balogh et al., 2016, Garavaglia and Mariani, 2017; Czine et al., 2020). Evidence shows that product Geographical Indications, significantly influence consumer assessment of meat products (Merlino et al., 2018). Information on geographic origin is used by consumers to identify the product and evaluate its quality (Merlino et al., 2018). Interest in PDO- and PGI-labelled products lies in the belief that these products are of higher quality (Verbeke et al., 2012) with higher nutritional and organoleptic qualities (Resano et al. 2007; Carpenter and Larceneux, 2008). Different certifications garner varying levels of recognition, especially in the Mediterranean region where a long tradition of food culture, specific agri-food policy, and geographic indication reigns (Becker, 2009). In this region, the PDO label receives greater recognition than does the PGI label (Loureiro and McCluskey, 2000; Teuber, 2011). Designation of origin can influence food product sensory perceptions as well (Savelli et al., 2020). Studies have documented consumer preferences for specific sensory attributes in PDO and PGI products, such as ham (Resano et al., 2007) and meat (Guerrero et al., 2014).

Tradition is key when buying a PDO or PGI meat product (Balogh et al., 2016). In fact, origin designation is the sentinel indicator for meat quality (Mesías et al., 2005). Studies of consumer preferences for the country of origin of meat generally confirm that consumers prefer domestic meat over imported meat (Font i Furnols et al., 2011; Du Plessis and du Rand, 2012; Realini et al., 2013). In general, country of origin has greater relevance for products coming from more developed countries (Verlegh and Steenkamp, 1999). Cicia and Colantuoni (2010) reported that willingness-to-pay (WTP) estimates vary depending on several characteristics: base price, meat type, food safety, and country of origin. Estimates of WTP also vary by country in which the analysis is performed and the methodology of the estimation analysis (Cicia and Colantuoni, 2010). Even though a PDO label is a quality stamp (Van Ittersum et al., 2007), it means more if the origin is considered to be of good reputation and geographically close to consumers (Resano et al. 2010). Raw hams with PDO labels are linked to a positive utility and higher WTP estimates in consumers. Territorial differences, based on consumer location, also affect consumer WTP (Garavaglia and Mariani, 2017). Furthermore, the attitude of consumers regarding certified PDO products positively affects their willingness to pay a premium price (Van Ittersum et al., 2007). Consumer attitudes toward raw ham in Spain was found to be positive and capable of leading to a higher WTP for certified PDO ham (Ciglia et al., 2006).

Consumer preferences for geographical indication and country of origin labelling are not always consistent. Hersleth et al (2011) found no influence from origin on consumer satisfaction. The authors found that ham origin information was useful to consumers, it was irrelevant compared with salt content information. Similarly, butchers have stated (Morales et al. 2008), and Loureiro and Umberger (2003) have found, that among quality attributes in beef products, product geographical origin labelling is not an important element to consumers. Consequently, geographic indications are considered inherently linked to signs of quality and safety mostly in their area of origin.

2.4   Price

Consumer attitudes toward meat purchases are influenced by several extrinsic factors including price (Resurreccion, 2004; Di Vita et al., 2022). While price does influence quality expectations positively (Acebrón and Dopico, 2000), its use as an actual quality indicator is mixed (Becker, et al., 2000).

The role of price in fresh and cured meat consumer preferences is often related to consumer socio-demographic characteristics (Font i Furnols et al., 2011; Reicks et al., 2011).

Verbeke and Viaene, (1999) reported that price does not influence the perception of meat generally; rather, it affects the perceived quality, freshness, sensory, and health attributes of the meat. Price was found to be less relevant than other attributes, such as country of origin and feeding system (in lamb and beef), although low pricing is a principal factor for some consumers (Font i Furnols et al., 2011;

Realini et al., 2013). For lamb consumption, price ranks as the main attribute when compared with traceability, safety, and origin (Mesías et al. 2005; du Plessis and du Rand, 2012). Price was confirmed as more important than origin and production system for lamb products by Bernabéu and Tendero, (2005).

In general, the expectations linked to higher pricing leads consumers to a greater appreciation of hams (Hersleth et al., 2011). One segment of the market (Sasaki and Mitsumoto, 2004) consistently holds the perception that a trade-off exists between price and quality. There is another segment of consumers who use price as a sign of quality, then tend to match preferences to an intermediate price (Mesias et al., 2009; Morales et al., 2013). Finally, there are consumers for whom price becomes a demand-limiting factor (Iberian cured ham); in this case, consumption is for special occasions only (Gaspar et al., 2022).

2.5   Socio-demographic characteristics

Significant links between attribute and socio-demographic characteristics have been revealed in meat products (Mendoza, et al., 2014; Arnaudova et al., 2022). Among these consumer characteristics, gender and income level must be considered for meat products. Health attitudes, consumption habits, and consumption frequency all affect WTP for such products (Di Vita et al., 2022), especially for price-sensitive young and low-income consumers. Older consumers with higher incomes accept dry-cured ham pricing more easily (Resano et al., 2009; Resano et al., 2012). As level of education trends with income, it is not unexpected that more educated dry-cured ham consumers are more tolerant of price (Resano et al., 2011). Consumers with higher incomes and women report higher satisfaction from dry-cured ham due to its perceived healthy attributes (Resano et al., 2011).

As for gender influences, women overall prefer products with healthy attributes more than men (Kiefer et al., 2005). Furthermore, males are less aware of the health characteristics of pork than are female consumers (McCarthy et al., 2004). It is not surprising that females show preferences for low-content sodium meat products as compared to men (Guardia et al., 2006) and supports work by Mendoza, et al. (2014) in which male consumers reported being unaffected by health problems consequent to meat product salt content.

Links between high income and healthy behaviours, such as not smoking, are not uncommon. The choice to follow a healthy diet, although personal attitudes toward safeguarding one's health plays a more important role in preferences than does income level (Moorman and Matulich, 1993). Nonetheless, higher-income consumers tend to be more health conscious (Petrovici and Ritson, 2006) and more willing to pay more for and to choose healthier products than those with lesser incomes.

Education level is also linked to healthy choices. Mendoza et al. (2014) found that more educated consumers are less affected by health problems related to high salt foods than those with lower education. Raw ham consumption frequency has been linked to greater overall satisfaction (Resano et al., 2011).

On the contrary, Schivazappa and Virgili (2020) did not find any differences due to socio-demographic characteristics or ham consumption frequency. The differences among consumer segments are not always ascribable to socio-demographic characteristics. Rather, they seem connected to consumer habits, as preferences are influenced by dietary patterns.

3. Methodology

3.1 Data collection

Trained researchers collected data for the study in Catania, Sicily, using a survey in face-to-face interviews. The questionnaire was developed by a focus group to reveal the most desirable characteristics of dry-cured ham and to confirm consumer attitudes for healthy and PDO product attributes. The focus group, comprised of invited experts, academicians, food technologists, and entrepreneurs, selected the main variables, attributes, and attribute levels in the survey. The group also helped to generate the final questionnaire consisting of three main sections: general characteristics of dry-cured ham consumption; conjoint experiment and sample socio-demographics. Data were collected in the retail area of Catania with individuals who consumed processed meat habitually (defined as at least once per week). The survey method used random walk recruitment to collect a convenient sample (Zanchini et al., 2022). Although this sampling approach has been applied extensively in consumer analysis and the validity of the results is accepted, the outcomes should be interpreted carefully since the possibility of making inference into the general population is low (Sama et al., 2019; Testa et al., 2019; Migliore et al., 2020). A total of 478 valid questionnaires were completed whose characteristics of interviewees are shown in Table 1. Various age groups were distinguished using Brosdahl and Carpenter (2011) classification: Millennials (born between 1982 and 2000, Generation X (born between 1961 and 1981), and Older generation (born before 1961, including both the Baby Boomer and Silent generation).

Table 1. Descriptive statistics of the sample (n = 478).

Variables	Categories	Frequency	Percent
Gender	Male	253	52.93
	Female	225	47.07
Age cohort	Millennials	292	61.09
	Generation X	147	30.75
	Older Generations	39	8.16
Education	Elementary and middle schools	131	27.41
	High school	173	36.19
	Bachelor's/Master's	146	30.54
	Ph.D and Specialty	28	5.86
Monthly Income	Up to 1500€	228	47.70
	1501- 3000€	123	25.73
	>3000€	41	8.58
	No answer	86	17.99
Family members	1-2 persons	90	18.83
	3 persons	121	25.31
	4 persons	198	41.42
	>4 persons	69	14.44
Sport activity	No sport activity	270	56.49
	Regular sport activity	208	43.51
Consumption characteristics	Mean consumption 100g/week (sd)	1.60 (0.94)	
	Mean price €/100g (sd)	2.13 (0.99)	

3.2 Data analysis: Conjoint experiment

Conjoint analysis (CA) was employed to interpret the preference orientation of the sample as it providing several outputs, such as mean relative importance and estimated utility, for each attribute level (Annunziata et al., 2016). In addition, CA allows partworth utility pattern estimation, which represents the preferences of each respondent, information useful for clustering (Di Vita et al., 2021b). The method relies on the assumption that consumers attempt to maximize their utility by observing product characteristics and then ranking them by the most favourable combination of attribute levels (Novotorova et al., 2008). Effective data collection requires that no more than six attributes be shown to consumers. Four attributes were chosen to build this model because fewer than six is recommended for a conjoint experiment (McCullough, 2002) (Table 2).

Table 2. Attributes and attribute levels employed in the conjoint experiment.

Attributes	Attribute levels
Price	1.90; 2.80; 3.60 euros
Reduced salt content	No; Yes
Nitrites content	No; Yes
PDO	No; Yes

The ranking CA for this study used an ordinary least squares model. Such a model considers the coefficients obtained from conjoint or partworth utilities as marginal probabilities (Hauber et al., 2016). After the model framework is chosen, efficiency and consumer response efficiency issues must be addressed. We turned to an orthogonal design to optimize model efficiency and produce precise estimates and improved consumer response efficiency. Orthogonal design is considered efficient when the underlying model is linear (Bridges et al., 2011) as in this work. Orthogonal design, as opposed to full-factorial design, is also best for response efficiency, as it facilitates choice making by allowing fewer cards to be administered to consumers (Wong et al., 2004). Table 3 contains the conjoint profiles obtained by orthogonal design. Cards 1 to 3 are presented graphically (Figure 1).

Table 3. Conjoint profiles obtained from orthogonal design.

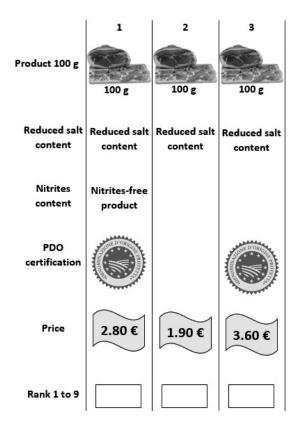| Option numbers	Price	Reduced salt content	Nitrites content	PDO
1	2.80	Yes	No	Yes
2	1.90	Yes	Yes	No
3	3.60	Yes	Yes	Yes
4	2.80	No	Yes	No
5	3.60	No	No	No
6	1.90	No	No	Yes
7	3.60	No	Yes	Yes
8	3.60	Yes	No	No

Figure 1. Example of conjoint cards adopted in the study

3.3 Data analysis: Clustering approach

A cluster analysis of individual consumer partworth utility patterns followed the conjoint experiment. The cluster analysis applied to utility patterns permitted consumers to be categorized based on their individual preferences (Annunziata et al., 2016). Ward's method was employed using the square Euclidean distance between objects (Di Vita et al., 2021b). The tool is useful for clustering because it minimises the sum of the square error to form groups with high-within-group homogeneity (Shan et al., 2017). Dunn's Index was used to determine a "best clusters solution", as it indicates cluster separation and internal coherence (Wajrock et al., 2008).

Following the cluster analysis, inferential tests were conducted to assess the presence of significant differences among the clusters. The first inferential test highlighted significant differences among cluster partworth attributes using one-way ANOVA (De Pelsmaeker et al., 2017). The second inferential statistic was the non-parametric chi-square test. It evaluated the null hypothesis of the random distribution of socio-demographic frequency among the clusters (Franke et al., 2012).

In summary, CA represents the first step for assessing trade-offs among attributes and their levels for consumers. To extend the conjoint, a cluster analysis is required that adopts the individual utility pattern as its source. Once clusters are obtained, inferential tests should be performed to assess if significant differences occurred.

All statistical analyses were performed using SPSS IBM STATISTICS 27 software, with the exception of the evaluation of the best cluster solution for which the R package NbClust was utilised (Charrad et al., 2014).

4. Results

4.1 Conjoint analysis

Conjoint analysis of the total sample (n = 478) was performed to obtain a general indication of the mean relative importance of the attributes and the utility generated by the different attributes (Table 4). Among the investigated attributes, nitrite content seemed to interest consumers the most, as evidenced by it having the highest mean relative importance value. The second most important attribute was price; similar values for low salt content and PDO certification ranked them as the third and fourth, respectively, most important attributes.

The results of the utility analysis for the entire sample shows that consumers prefer mid-priced products without excluding cheaper ones and that they perceive high-price products negatively. Among health-related attribute levels, positive utility arises from both low salt content and the absence of nitrates as both are positively perceived. Finally, despite PDO certification receiving less attention in the sample, the presence of the geographical indication has a positive estimated utility coefficient.

Table 4. Results of conjoint analysis (n=478).

Attributes	Levels	Utility Estimate	Mean relative importance
Price	1.90	0.054	
	2.80	0.093	26.478
	3.60	-0.147	
Reduced salt content	No	-0.544	21.682
	Yes	0.544	
Nitrites content	No	0.677	30.530
	Yes	-0.677	
PDO	No	-0.703	21.310
	Yes	0.703	
Constant		4.537	
Goodness of fit	Pearson's R	0.961 (0.000)	
	Kendall's Tau	0.786 (0.003)	

4.2 Cluster analysis

We combined a cluster analysis with CA to investigate whether differences in utility and mean relative importance of various attributes exist in different consumer groups. The analysis was performed on individual consumer utility patterns (Table 5.) The highest value of Dunn Index (0.2925) was obtained for the three cluster solution. Analysis of the attributes and their levels for consumers show a good differentiation among clusters. All attribute levels were significant among the groups based on ANOVA performed on the individual patterns of consumer utility. Then, the cluster analysis made it possible to associate socio-demographic and consumption characteristics with product attributes and attribute levels (Table 6). This approach provides a deeper understanding of consumer characteristics and the utility pattern distribution across different consumer categories. Several significant socio-demographic and behavioural differences among the groups were highlighted by the chi-square test for frequency analysis (Table 6).

Table 5. Results of hierarchical cluster analysis (n=478).

Attributes	Levels	Low-salt (LS) Cluster (n = 180)		Price-sensitive (PS) Cluster (n = 81)		Health/origin (HO) Cluster (n =217)	
		Utility Estimate	Mean relative importance	Utility Estimate	Mean relative importance	Utility Estimate	Mean relative importance
Price	1.90 ***	0.653		-1.483		0.131	
	2.80 ***	0.392	35.596	-0.266	57.041	-0.021	7.507
	3.60 ***	-1.044		1.749		-0.111	
Reduced salt content	No ***	-1.196	34.800	0.395	12.805	-0.354	14.115
	Yes ***	1.196		-0.395		0.354	
Nitrites content	No ***	-0.178	13.433	-0.531	14.623	1.838	50.649
	Yes ***	0.178		0.531		-1.838	
PDO	No ***	-0.514	16.171	-0.324	15.532	-1.001	27.729
	Yes ***	0.514		0.324		1.001	
Constant		4.761		4.063		4.528	
Goodness of fit	Pearson's R	0.900 (0.001)		0.989 (0.000)		0.996 (0.000)	
	Kendall's Tau	0.786 (0.003)		1.000 (0.000)		1.000 (0.000)	

*** P <0.01 according to one-way ANOVA test.

Low-salt (LS) Cluster. The cluster, identified by mean relative importance and coefficient values, pays particular attention to low salt content products, whereas the other health-related attribute (low nitrites) was of least importance to this group. In fact, low nitrite content always ranked as least important when comparisons were made between clusters. Price, the second most importance attribute to this cluster, showed these consumers are attracted by medium- and low-price products. Finally, the consumers in this cluster show positive utility for PDO-certified products, even if the average importance attributed is low relative to price and sodium content. The socio-demographics

of this group can be generally characterised as men with medium-high education levels and average incomes. Different family sizes are well represented in the cluster. Overall, consumers belonging to this cluster do not practise a sport regularly. Consumption habits are characterised by lowest-price purchasing, with a considerable perceived utility for hams in the low-medium price range.

High-price sensitive (PS) Cluster. These consumers attach enormous importance to price, and they consider it the sign of quality in expensive products. The low mean relative importance values indicates that this group views all attributes are of scarce or no importance to them, relative to price. Coefficient values indicate that they perceive low salt negatively, but the presence of nitrites is perceived as a positive. This consumer also seems to be sceptical of non-traditional products, as evidenced by the positive coefficient linked to PDO labelling.

Socio-demographically, both genders are represented. Education levels for the group are generally low, although their medium-high incomes allow them to afford higher-price products. In this group, family size classes are well distributed with a slightly higher prevalence of families comprised of more than four. Sports are practised the least by this cluster as compared to the others. Consumption habits for the families in this group show they rank lowest in the amount of product per member and pay the second-highest price. The price paid is consistent with the low importance they attach to certification or other features that can increase the price of the final product.

Health and typicality-conscious (HT) cluster. This cluster considers nitrite-free and PDO-labelled products to be of relatively average importance providing higher utility. Price is of little importance to this group, although a positive coefficient is attached to low-cost products. This value set suggests that these consumers prefer non-expensive products, but they are willing to purchase expensive products if they perceive the presence of other quality attributes. These value-conscious individuals look for quality at a good price and take advantage of promotions to make purchases. They are attentive to quality, and their consumption claims suggest they purchase higher quantities at higher prices relative to the other groups. Socio-demographically, this group is mostly female with more education and low income. The family unit for this group numbers four most often, which is reflected by a high weekly average ham consumption. Consumers who regularly practise sports are also concentrated in this group.

Table 6. Socio-demographic and consumption features of the clusters.

Variables	Categories	LS Cluster	PS Cluster	HT Cluster	chi-square statistic	p-value
Gender	Male	0.67	0.58	0.39	32.092	0.000
	Female	0.33	0.42	0.61		
Age cohort	Millennials	0.57	0.72	0.60	6.153	0.188
	Generation X	0.34	0.20	0.32		
	Older Generation	0.09	0.09	0.07		
Education	Elementary and middle schools	0.39	0.49	0.10	76.036	0.000
	High school	0.35	0.30	0.40		
	Bachelor's/Master's	0.24	0.16	0.41		
	Ph.D and Specialty	0.02	0.05	0.10		
Income	Up to 1500€	0.38	0.21	0.86	121.156	0.000
	1501- 3000€	0.44	0.56	0.14		
	>3000€	0.18	0.23	0.01		
Family members	1-2 persons	0.27	0.27	0.09	31.366	0.000
	3 persons	0.26	0.22	0.26		
	4 persons	0.38	0.32	0.48		
	>4 persons	0.09	0.19	0.17		
Sport activity	No sport activity	0.61	0.69	0.48	13.308	0.001
	Regular sport activity	0.39	0.31	0.52		
Consumption characteristics	Mean consumption 100g/week	1.51	1.44	1.74	4.297	0.014
	Mean price €/100g	1.86	2.09	2.37	13.941	0.000

Summarizing the results, cluster analysis allowed detection of three groups that differed in individual utility patterns and socio-demographic characteristics. One group is more attracted to low-sodium content, another is mainly driven by price, and the other group is interested in nitrite-free and PDO-labelled products. Table 7 provides a synthetic description of the consumer profiles for each of the three identified clusters.

Table 7. Consumer profiles of the three clusters.

	Low-sodium consumers	High-price sensitive consumers	Health and typicality-conscious consumers
Gender	MALE	-	FEMALE
Education	LOW	LOW	HIGH EDUCATION
Income	MEDIUM-LOW	MEDIUM-HIGH	LOW INCOME
Household	-	MORE THAN 4	4 MEMBERS
Consumption	-	LOW	HIGH
Sport activity	NO SPORT	-	SPORT

5. Discussion

This research confirmed our initial assumption that a consumer preference hierarchy exists for the various attributes of dry-cured ham. Our hypothesis was fully corroborated since each attribute, differentiated by level, appears differently correlated to potential healthiness. Our hypothesis that the PDO label ranked high in this hierarchy was shown to have less utility, despite being significant to one potential market segment. Overall, no consistent polarization was observed between a specific cluster and its related attributes. This outcome aligns with previous studies in which consumer preferences varied and clustered around different liking patterns (Resano et al., 2010; Guerrero et al., 2018). We can answer the first research question affirmatively because we found hierarchical dimensionality in consumer preferences among the investigated attributes. However, a trade-off among different attributes was not well defined. In fact, our work showed that health and origin are not unidirectional, attributes; rather, they tend to overlap in two of the three identified consumer groups.

Even though attributes carry different utilities for different consumers, our study answered the second research question by highlighting the importance of nitrite absence for consumers, the first positive-utility attribute. This result is consistent with empirical evidence that shows that the presence of nitrites tends to discourage cooked ham and salami purchases (Di Vita et al., 2019a; Hung et al., 2016b; Di Vita et al., 2019b). It also confirms the harmful opinion consumers have of chemical additives in cured meats (Hung et al., 2016a).

The role of price is quite controversial. For the many consumers not affected by the relevance of productive process and origin (high-price sensitive cluster), price ensures a higher quality. This confirms past studies, given price affects dry-cured ham consumers who considered it as a signal of product quality, whose utility grows as the price increases (Mesias et al., 2009). In fact, the literature shows that consumers' purchasing intention for processed meat is strongly influenced by price. (Font-i-Furnols and Guerrero, 2014; Di Vita et al., 2022).

As regards price level, on average, intermediate price was favoured. This result is consistent with previous finding whereby the consumer accords its preferences to dry-cured ham at intermediate prices (Morales et al., 2013). Likewise, despite high price registered a negative utility, it was the only preferred by high-end consumers. This result confirms the attitudes of some consumers who use price as a signal of product quality in their choice of ham, showing an increasing utility as price increases (Mesias et al., 2009).

The fact that the health/origin-conscious consumer cluster also chose low-cost, dry-cured ham indicated that there was stratification for different price utilities whose range resulted as equally important. Each price level (low, intermediate, and high) is demonstrated to be significant within specific consumer clusters, which suggests that price assumes different importance according to

consumer cluster (market segment). In any case, its role as a decisive factor that influences consumers choices is certain.

Our results aligned generally with what other authors have found for salt content and PDO attributes within the full sample model when mean relative importance was similar. For instance, it was also found that lower sodium salt levels generate higher expectations and positive utility (Hersleth et al., 2011; Schivazappa and Virgili, 2020), while in the case of PDO labelling, designation of origin certification is perceived as an important meat product quality sign that generates a positive utility for consumers (Garavaglia and Mariani, 2017).

The research question regarding the potential for market segmentation can be discussed because the study also considered the importance of socio-demographic characteristics and how they interrelated with specific dry-cured ham attributes and attribute levels. Gender, education and income levels, and family size were considered; each provided nuanced insight into potential market segments.

Despite the known appeal to men of dry-cured ham (Resano et al, 2011), our results showed gender overlap with respect to the importance both genders ascribed to healthy attributes. Thus, our findings only partially confirmed earlier empirical evidence. Indeed, female consumers dislike nitrites and attach moderate preference to the PDO label (HO cluster), implying that geographical origin and healthy attribute coexist in the minds of female consumers. It also highlights their greater awareness of and attention to healthier products, which agrees with previous work (Kiefer et al., 2005).

Another study on low-nitrate salami consumption showed that a large share of women not only preferred and consumed healthier meat products than men, but also were willing to pay a premium price (+20%) for such products (Di Vita et al., 2019b).

The men sampled for our study displayed their attitudes for healthy products through their interest in reduced salt meat products (LS cluster). Previously, highly positive attitudes for heathy diets and reduced-sodium meat products had only been described for women (Guardia et al., 2006; Predieri et al., 2020). This suggests that the profile of the male consumers in the study sample differed from that of the earlier research on pork and reduced salt cured meats consumption (McCarthy et al., 2004 Mendoza, et al, 2014). This last result could be due to the fact that even male consumers have progressively turn their attention to nutritional content of cured meats, becoming more aware of health risks deriving from additives or preservatives content like sodium.

Generally, more educated consumers accord more preference to healthy and PDO-labelled dry-cured hams. Most highly-educated consumers attribute more importance to nitrites. The importance of education level to cured meat consumption habits likely relates to a relationship found between education level and product knowledge (Ni Mhurchu et al., 2010). Our results aligned with previous studies, and in particular, with Mendoza et al. (2014), who showed that low-educated consumers are

the least engaged in health issues related to salt reduction. This study also revealed that only men and low-educated consumers consider price as a quality cue (PS cluster). This expected result is in line with studies reporting a price sensitivity that comes from a correlation between education level and income (Resano et al., 2011; Díaz-Caro et al. 2019).

Predictably, income level affects pricing preferences. Whereas low-income consumers view a low-priced ham as beneficial (PS cluster), medium- and high-income consumers consider price as a quality indicator. Freed from price as a constraint, their higher income level permit them to purchase based on their preference for low-sodium products (LS cluster). Our results are consistent with earlier findings, which showed that low- and middle-income consumers are more price-sensitive than others (Resano et al., 2012; Di Vita et al., 2019a). As previous studies have indicated, consumers with high income are more health conscious (Petrovici and Ritson, 2006; Nordström and Thunström, 2015) and can afford healthier options. Furthermore, high incomes are positively correlated to higher satisfaction for the health attributes in dry-cured ham (Clonan et al., 2016).

We also considered the effect that family size has on the relative importance of dry-cured ham attributes. Larger families primarily seek low-cost products, but also look at quality attributes, such as PDO certification and low nitrate levels (HO cluster). On the contrary, smaller families are willing to pay more for and attach greater importance to products that are priced higher (PS cluster) and nitrate-free (HO cluster). This finding is somewhat inconsistent with Resano et al. (2011), which found that family size correlates inversely with low-cost product preferences and that single households are more inclined to choose low-cost products as compared to multi-membered families (Scholderer and Grunert, 2005). Our result can be attributed to higher marginal cost, in terms of time, effort, and money, expended by a single-member family versus a larger family.

Another socio-demographic characteristic analysed for the sample population was sport activity level. Less active (no regular sports practise) consumers tend to prefer low-salt dry-cured ham, and use price as an indicator of quality, while active (regular sports practise) consumers prefer PDO-labelled and nitrate-free products. Our results agree with the general view that sports enthusiasts prefer healthier foods (Drescher et al., 2009), but they may also reveal the less-than-full awareness sport practitioners have of potential health risk attributes (salt content). This issue was foreshadowed in a study of active consumer perceptions toward salt and nitrates compounds (Di Vita et al., 2019b).

Higher quantities and higher-priced products are HO cluster consumption habits, who trend toward nitrate-free PDO products, possibly at lower prices. While this combination may carry contradiction, the low mean relative importance value assigned to the price attribute suggests that the importance assigned to price is minimal. Consumers in the HO cluster are not repelled by high quality products,

but they prefer to purchase these high-quality products at a low price (on offer if available). Finally, no significant effect was found for the age cohort.

6. Conclusion

The roles that health-risky additives (salt and nitrites) and long-held traditions (PDO certification) play in setting consumer utilities for dry-cured ham were evaluated in this study. Using a socio-demographic cluster approach on a convenience sample, we identified different consumer profiles related to dry-cured ham consumption. The main findings of the consumer profiles were uneven, and a scarcely-consistent polarisation between market segments and attributes was also noted.

For attribute price, we observed stratification of different price utilities as each price level becomes an opposing and relevant influence for all consumer clusters. In the case of consumers with low levels of education for whom price is used as a quality indicator, high price is their cue to purchase what they presume to high-quality dry-cured ham. Also revealed was the coexistence preference for PDO and healthy attributes in a consumer cluster, consisting of highly-educated consumers and women. Surprisingly, we discovered that even though low salt content is not strictly related to nitrites, it seems that consumers never associate the two, which suggests that no homogeneous market segment has comprehensive awareness of health. The study also made evident that there is a breakdown in the understanding of traditional food production processes (e.g., GIs) and the potential for health risks linked to additives. Any specification changes in PDO cured meats must be better aligned with consumer preferences. Our results suggest there is a need to innovate within the traditional cured meat industry, with an emphasis on reformulating additives used for generations. Finally, for the first time, an increasing attention toward healthy attributes was highlighted among male consumers.

6.1 Implications

This study paper delivers theoretical, marketing, and policy implications. Theoretical contributions to the existing literature include insights on the role that innovation plays in traditional PDO products. While price plays a marginal role in consumer choices, PDO certification remains relevant but not a top priority for health-related aspects. Consequently, the traditional production attribute, mediated by territorial claim differences (PDO), ranks between two nutrition claims that reshape and recast the claim hierarchy in a patchy way. Results also show that innovation to enhance the health aspects of cured meat products seems to be partially more important than the need to preserve the traditionality of product.

In terms of market implications, the outcomes show slight changes in consumption patterns of typical food product given the arising demand for healthier cured meat products. This makes it especially

important that consumer preferences be fully understood when innovation is strictly linked to the health characteristics of product, since consumers are not sceptics in accepting new formulation of the traditional product. In addition, the driving forces that influence the consumption of dry cured ham can be useful for a market segmentation and identify strategies and actions to translate these results into concrete and shared production policies.

Policy stakeholders can also benefit from the findings in this study. Consumer demand for healthier cured meats will require members of the consortium for dry-cured ham to revise their PDO production regulations and procedures. To improve product utility, producer associations could better differentiate products by enhancing food labels. Labelling can both improve consumer decision making and raise product safety utility, and it may result in market expansion and profitability. Innovation seems possible even for foods as traditional as Italian dry-cured ham, especially when the attributes to be modified are health related.

6.2 Limitations and Further Research

Several study limitations require discussion: nature of the survey, sample recruitment, and number of selected attributes. The survey may not reflect the average Italian population because the analysis was based on a consumer convenience sample. Future investigations would benefit from expansion of the experiment to other Italian and European regions. Second, sample recruitment carries its own constraints that suggest caution when broadening results to a larger population. The research would also benefit from the addition of more cured ham health attributes (e.g., low-fat content) to complete the consumer preference profile and hierarchy of attributes and attribute levels. Research is needed to determine if low salt content may influence consumer perceptions of raw ham quality. Further lines of research could be begun to address purchasing patterns related to other lifestyle and health concerns for processed meat. Finally, compounds for which some consumers are intolerant, like histamine found in sausages, raw, and cooked hams, should also be explored.

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Highlights

- The existence of a clearly defined hierarchical order in consumer preferences for attributes of dry-cured ham has been found.

- The study highlighted the great importance attached to the absence of nitrites; the first attribute in terms of positive utility.

- Price was considered by many consumers as a signal of product quality.

- Men show for first time an increasing attention to low-salt content product.

- High-educated consumers accord their preference to healthy and PDO labelled ham with fewer nitrites.

Declaration of interests

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

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: