A horse on your plate? A cluster analysis of French consumers hippophagy acceptance

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DATA AVAILABILITY STATEMENT

Data available on request from the authors

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Abstract

Hippophagy is a practice that is far from being consensual, even among meat eaters. Horse meat consumption remains limited or is even strongly declining in some countries such as France. However, the nutritional, organoleptic and environmental benefits of this meat invite us to consider horse meat products as a valuable alternative source of protein. This research therefore aims to identify and characterize different profiles of consumers and non-consumers of horse meat in terms of personal values, attitudes, motivations and behaviors. Based on data from a quantitative survey among 482 French meat consumers, we distinguish 4 categories of individuals: "Enthusiast", "Distant", "Aversive" and "Potential". While "Distant" and "Aversive" show a low level of acceptability towards horse meat, "Enthusiast" and "Potential" reveal characteristics that are favorable to horse meat consumption. Targeted strategies to support the horse meat market are proposed and discussed in light of these results that also provide insight into the future for meat in general.

KEYWORDS: Consumer behavior, Cluster analysis, Horse meat consumption

1 Introduction

Humans' relationship with meat is particularly complex and ambivalent. Meat is a valuable source of protein and a sought-after palatable food associated with symbolic representations of strength, power and masculinity (Dowsett et al., 2018; Ruby & Heine, 2011). Yet, loving animals and killing them for food poses a moral dilemma that creates a cognitive dissonance, also called "meat paradox". (Benningstad & Kunst, 2020; Dowsett et al., 2018; Lin-Schilstra & Fischer, 2020). More recently, the consumption and production of meat arouses increasingly pressing questions about the sustainability of our food models (e.g., Willett *et al.*, 2019). In particular, the central place of red meat from intensive feedlots in the diets of Westerners is being challenged due to its detrimental impacts on the planet, animal welfare, and human health (Westhoek et al., 2014; Wiart et al., 2022; Willett et al., 2019).

Changing consumer behavior towards beef may provide a consumption opportunity for unfamiliar red meats from alternative animal species such as game, elk, kangaroo, ostrich, or horses (Popoola et al., 2020). Among these, horse meat represents a niche market that offers opportunities to develop supplementary high-quality red meat with less impact on the environment than beef (Balji et al., 2020; Jastrzębska et al., 2019; Lorenzo et al., 2014; Rzekęć et al., 2020).

Compared to cattle, equines are non-ruminant herbivores that emit five times less methane into the atmosphere, making their meat production a more climate-friendly source of food (Franz et al., 2010; Moss et al., 2000; Rzekęć et al., 2020). In terms of biodiversity, the breeding of draught horses for slaughter enables the conservation of several local breeds threatened with extinction and therefore helps to preserve the genetic diversity and the resilience of domestic species (Belaunzaran et al., 2015). In addition, extensive horse farms in Europe contribute to the maintenance of grasslands and sensitive areas and to the touristic appeal of rural landscapes, while ensuring high standards of animal welfare (Insausti et al., 2021; Rzekęć et al., 2020). Finally, when sanitary conditions allow, the slaughtering and

human consumption of horses from sport, leisure, or racing sectors is an interesting alternative to euthanasia, which avoids meat wastage, ensures an economic residual value to horses until the end of their life, and is an improvement for the horse's welfare compared to abandonment and starving (Jez et al., 2013; Whiting, 2007).

Nutritionally, horse meat, compared to pork, beef, or poultry, is characterized by low levels of fat and cholesterol, higher concentrations of heme iron, polyunsaturated fatty acids (omega 3 and 6) and proteins, making this meat a particularly healthy food (Balji et al., 2020; Belaunzaran et al., 2015, 2017; Lorenzo et al., 2014; Poławska et al., 2013). Finally, the sensory profile of horse meat differs little from beef in terms of aroma and flavor (Popoola et al., 2019; Rødbotten et al., 2004) and its dark red color, extreme tenderness and slightly sweet taste are potentially attractive organoleptic properties for red meat consumers (Balji et al., 2020; Lorenzo et al., 2014; Oh et al., 2009).

Despite the benefits of this meat, worldwide production of horse meat represents only 0.25% of the global meat market; and the average available consumption is about 0.10 kg per capita (Belaunzaran et al., 2015).

While extensive literature has closely examined beliefs, attitudes, and practices associated with commonly consumed categories of meat, such as beef, chicken, and pork, horse meat as a specific category of alternative red meat is poorly documented. The aim of the present research is to address this gap. More precisely, we investigate the individual characteristics of consumers and non-consumers of horse meat in France. Within Europe, France is the only country, along with Spain, to produce, export, slaughter, and consume horse meat on its territory (FranceAgriMer, 2015). France is one of the main importers and exporters of horse meat on the global market, and one of the countries where the mean consumption of horse meat per capita is higher than the world average (Belaunzaran et al., 2015). However, French horse meat consumption has fallen by a factor of 20 over the last 50 years going from 1.73kg per capita per year in 1970 to 0.09kg per capita per year in 2020 (IFCE 2011, 2021). Half of

72 the distribution of this meat is equally split between specialized butchers and supermarkets
73 and hypermarkets, with direct sales representing a very small share (Cazes-Valette, 2008).
74 The number of horse butchers in France is steadily decreasing, with 750 counted in 2014 by
75 the Federation of French horse butchers[1]. This dramatic drop suggests that some French
76 people no longer consider horse as meat edible and even for those who are likely to consume
77 it, barriers such as lack of knowledge or low availability contribute to the disappearance of
78 this meat from their food repertoire.
79 Several levers and barriers of acceptance and consumption of horse meat can be considered.
80 At a macro level, socio-technical and cultural factors like religion and public policy have
81 influenced the relationship that humans have with horses, and has governed the acceptance
82 and consumption of horse meat throughout the centuries (Whiting, 2007). In the 19th century,
83 considered as inexpensive, healthy and nutritious, horse meat was progressively legally
84 authorized for human consumption in several European countries (Belaunzaran et al., 2015;
85 Digard, 2012; Lamy & Vial-Pion, 2020; Lizet, 2010). Nowadays, hippophagy faces different
86 socio-technical and economic changes inducing a reduction in its consumption (Jez et al.,
87 2013). Access to meat in general has become more democratic and the price of beef has
88 decreased while that of horse meat has increased to become the most expensive meat product
89 (IFCE, 2021). It has also become increasingly difficult to source and buy horse meat (Bigot et
90 al., 2018; Jez et al., 2013; Leteux, 2005). Moreover, throughout the 20th century, the
91 evolution of the uses of the horse in Western societies - from a working and breeding animal
92 to a sporting and recreation animal - has considerably modified the representations of humans
93 towards horses, switching from an edible animal for human consumption to a pet
94 inappropriate for it (Lizet, 2010; Jaskari, Leipämaa-Leskinen and Syrjälä, 2015).

[1] https://france3-regions.francetvinfo.fr/auvergne-rhone-alpes/2014/10/03/quel-avenir-pour-la-consommation-de-viande-de-cheval-564274.html

At a micro level, two main types of considerations can shape the acceptability of a food product (Font-i-Furnols & Guerrero, 2014; Köster, 2009a; Verbeke & Viaene, 1999). First, ethical and moral considerations refer to a set of variables with affective and emotional components. A general negative or ambivalent representation of meats and animals, negative feelings such as guilt, worry or disgust are generally associated with meat avoidance. For example, Lamy et al. (2022) show that a high level of affective attachment to horses interferes with individuals' representations of horse meat and limits the intention to consume this product. Popoola and colleagues (2021), in a quantitative survey that compared the perceptions of three red meats - beef, bison and horse meat – among Canadian consumers, showed that horse meat was associated to a pet that is cruel, unethical and socially unacceptable to eat, and that people tend to express a feeling of disgust towards horse meat. The second type of acceptability factors refer to the perceived characteristics of the meat, ranging from the intrinsic properties in terms of sensory and organoleptic qualities, nutritional or environmental benefits, to extrinsic attributes such as production organization, price, availability and market positioning (Font-i-Furnols & Guerrero, 2014; Verbeke, Sans, et al., 2015). Thus, consumer attitudes influence individuals' partiality for a set of different meat attributes, moving towards or away from it (Verbeke, Marcu, et al., 2015). For example, although individuals do not tend to distinguish between the sensory characteristics of beef and horse meat, for consumers of the latter, tenderness, juiciness and flavor are inherent positive factors that drive preference and taste for this meat (Popoola et al., 2020) while safety, price, origin and leanness have been identified as critical attributes of horse meat among Korean consumers (Oh et al., 2009).

However, consumer attitudes towards food products are usually formed based on prior experience and habits (Verbeke & Vackier, 2004). The evaluation of meat attributes therefore varies according to the level of familiarity with the meat and the willingness to try unfamiliar products. In particular, with respect to horse meat consumption, it is worth highlighting that

individuals are largely unfamiliar with this product and the lack of availability in the market environment limits their exposure and in turn the opportunities to encourage them to try it (Lamy et al., 2022; Popoola et al., 2020, 2021b).

A better understanding of consumer and non-consumer profiles is therefore needed. What motivates people to consume horse meat or not? Who are the current French consumers of horse meat? Among the non-consumers, are there profiles that would consider adding horse meat to their diet? Guided by these questions, we present the results of a cluster analysis that aims to identify and characterize different profiles of consumers and non-consumers in terms of personal values, attitudes, motivations and behaviors. In doing so, this work sheds light on the potential levers and obstacles to horse meat consumption in order to develop marketing strategies designed for the different consumer segments.

The following sections outline the methodology and results of the study before discussing the theoretical and managerial implications of the research.

2 Materials and methods

The results reported here were obtained in the course of a larger study about consumer motives and barriers regarding horse meat consumption, including qualitative (see Lamy *et al.*, 2022) and quantitative studies.

2.1 Sample

Thanks to the first results of the program based on qualitative interviews among consumers and non-consumers of horse meat (Lamy et al., 2022), a questionnaire was created to conduct

143 a survey among meat consumers. The questionnaire was disseminated in France in 2020,
144 online via social networks (Facebook, LinkedIn) and mail shots. Prior to the survey itself,
145 participants were asked to give their consent to participate in the study and were informed that
146 they could stop at any time. They were also informed that the study was anonymous and that

147 the data would be analyzed at the group level. The study was conducted in accordance with
148 the regulation of the EU General Data Protection Regulation.
149 A total of 482 valid questionnaires were analyzed. Table 1 presents the characteristics of the
150 sample. Distributions of gender, age, education, and family composition show that the sample
151 covers a wide range of respondents, though without being statistically representative of the
152 French population.
153153

154 Table 1. Characteristics of the valid sample (% of respondents, n=482)

155155

156 2.2 Measurements

157 **Meat and horse meat consumption** were measured by asking participants to answer the
158 following questions « How often do you eat meat? » and « How often do you eat horse
159 meat? » on a 5-point frequency scale ranging from 0 ‘never’ to 4 ‘every day’. Vegetarians
160 were excluded from the study. In the analysis, the variable regarding horse meat consumption
161 was dichotomized in order to distinguish individuals who do not currently eat horse meat
162 (value =0) from individuals who eat horse meat more or less regularly (value =1). For
163 individuals who reported never eating horse meat, an additional question asked them whether
164 they had ever tasted it and if so, if it was during childhood or adulthood. Finally, horse meat
165 consumers were also asked where they usually purchase their horse meat.
166 **Personal norm** is generally understood as personal values that result in a sense of moral
167 obligation to act in a certain way (Schwartz, 1977). Personal norm towards horse meat
168 consumption was measured using three items: "Eating horse meat is in line with my values",
169 "In my opinion, eating horse meat is not moral," "I would feel guilty if I ate horse meat," on a
170 5-point scale from 1 ‘strongly disagree’ to 5 ‘strongly agree’ and middle anchor 3 ‘neither
171 agree nor disagree’. The last two items were reverse coded prior to calculating the mean of the

three items (α=.90). The closer the mean value to 5, the less individuals report a personal norm opposed to horse meat consumption.

The **meat attachment** scale reflects the multi-dimensional components that characterize the psychological place of meat consumption in food practices. In the present study, we use the MAQ (Circus & Robison, 2019; Lentz et al., 2018) to characterize consumers based on individual differences in consumer appraisal of meat in general, and thus take into account the broader psychological relationship that people have with meat. A scale was included to measure to what extent people feel attached to meat products in terms of hedonism, affinity, entitlement and dependence (Circus & Robison, 2019; Graça et al., 2015). Participants were asked to rate 15 statements, on a scale from 1 'strongly disagree' to 5 'strongly agree', and middle anchor 3 'neither agree nor disagree'. The hedonism subscale comprised four statements including "You can't beat a good steak" and " Eating meat is one of life's simple pleasures". The affinity subscale comprised four statements, which were all reverse coded for analyses such as "I feel bad when I think of eating meat" and "Eating meat is disrespectful towards life and the environment". The entitlement subscale was comprised of three statements: "According to our position in the food chain, we have a right to eat meat", "To eat meat is an unquestionable right", and "Eating meat is a natural and indisputable practice". Lastly, the dependence subscale was made up of four statements including "Meat is irreplaceable in my diet", "I would feel fine with a meatless diet" (item reversed for analysis). Since the four subscales, hedonism (α=.88), affinity (α=0.80), entitlement (α=0.79) and dependence (α=0.79) show high internal consistency, each group of statements was averaged to create a subscale score.

The **disgust** scale developed by Rozin and Fallon (Rozin & Fallon, 1980) has been adapted to examine whether horse meat products generate aversion and may vary among consumer segments. In line with the authors, 8 statements including "The thought of eating horse meat makes me nauseous", and "I dislike horse meat because of the idea of what it is or where it

198 comes from" were evaluated on a 5-point scale from 1 'strongly disagree' to 5 'strongly
199 agree' and middle anchor 3 'neither agree nor disagree' (α =.92).
200 **Objective knowledge** characterizes the stored information and its organization in the
201 memory, that is, what the consumer actually knows about the product (Banović et al., 2012).
202 To assess consumers' knowledge of horse meat, we developed a knowledge questionnaire
203 derived from previous exploratory interviews with 23 consumers and exchanges with experts
204 in the equine sector. People were asked to answer "true", "false" or "don't know" to nine
205 statements about the horse meat industry, including on livestock, environmental benefits and
206 nutritional properties of horse meat (see appendix 1). For each respondent, the total number of
207 correct responses was calculated to generate a 9-point knowledge score.
208 **Attitude** was studied through a consumer evaluation of meat attributes, adapted from prior
209 published studies on attitude towards fresh meat (Banović et al., 2009; Verbeke & Viaene,
210 1999). Some of the items identified in the above-mentioned papers were removed because
211 respondents found them confusing during the test questionnaire. In the final version,
212 participants were asked to rate 8 horse meat attributes: quality, taste, health benefit, presence
213 of harmful substances, trust in the product, respect for animal welfare, ease of cooking and
214 safety on a 7-point semantic differential scale (Osgood, Suci & Tannenbaum, 1957) with end
215 points associated with bipolar labels from -3 to +3. In the analysis, the score of each attribute
216 and an aggregate score of attitude equal to the average of all attributes (α=.84) has been used
217 to describe consumer segments. In terms of interpretation, the more the responses tend
218 towards a value of 3, the more the respondent reports a favorable attitude towards horse meat.
219 **Social norm,** (Ajzen, 1991) or the subjective feeling of peer pressure regarding horse meat
220 consumption has been obtained through responses to three items: " My family approves of me
221 eating horse meat", "My friends approve of me eating horse meat" and "People who are
222 important to me think I should not eat horse meat". They have been scored on a 5-point scale
223 from 1 'strongly disagree' to 5 'strongly agree' with middle anchor 3 'neither agree nor

disagree'. The last item was reverse coded prior to calculating the mean of the 3 items (α=.72). Thus, the closer individuals are to 5, the more they express a subjective social norm supportive of horse meat consumption.

Purchase facility captured the extent to which individuals are able to source and buy horse meat in their market environment. Respondents were asked to evaluate the following 3 items on a 5–point scale from 1 'very easy' to 5 'very difficult' : "Sourcing horse meat near where I live" "Sourcing horse meat in my usual shopping areas", "Sourcing horse meat in restaurants". Sufficient internal reliability (α=.73) allowed us to use the average score of the three items to identify differences among consumer profiles.

Finally, the questionnaire included relevant sociodemographic characteristics like age, gender, education and presence of children in the household as presented in Table 1.

The questionnaire was pre-tested and refined before being disseminated online.

2.3 Classification

3 variables were used to classify individuals: the frequency of meat consumption, consumer or non-consumer of horse meat, and personal norm towards horse meat consumption[2].

To classify the respondents, a two-step cluster analysis procedure (Chiu et al., 2001) available in SPSS (V25) was applied. This mixed-method approach involves creating a pre-grouping of observations into a large number of classes using a partitioning algorithm similar to K-Means, and then performing a hierarchical aggregation of these pre-classes using a log-likelihood based measure (Mooi & Sarstedt, 2011, p. 259). Less commonly used than hierarchical or dynamic clustering methods, this approach offers the advantage of dealing simultaneously

[2] This choice is based on the following reasoning. Attitude towards a food product is the result of past experiences and consumption habits (Köster, 2009b). Therefore, a segmentation that takes into account the frequency of meat consumption (as a food category) and of horse meat (as a specific product within the meat category) is relevant to

explore attitudinal differences towards horse meat. In addition to these two behavioral variables, taking into account moral conviction allows us to distinguish between individuals morally opposed to horse meat consumption and those for whom it remains morally acceptable.

with qualitative and quantitative variables (Mooi & Sarstedt, 2011, p. 259), which is appropriate in our case study. Furthermore, the classification results are accompanied by a silhouette measure of intra-group cohesion and inter-group distance to guide the often delicate choice of the number of classes to retain (Mooi & Sarstedt, 2011).

The classification being sensitive to the order of the observations, the procedure was repeated 5 times by randomly modifying the order of the subjects.

A 4-class typology was considered the optimal solution in terms of group size, and interpretability. The silhouette measure, with an average value of 0.5, indicates that intra-class cohesion and inter-class distance are of good quality (Rousseeuw, 1987). In order to detect differences on key dimensions among segments, a set of ANOVA and χ^2 tests was conducted on classification and illustrative variables. In all tests, the statistical significance was considered significant at $p < 0.05$.

3 Results

Firstly, we present meat and horse meat consumption among the sample, which allows us to subsequently categorize it into four segments. Within each segment, psychological and then external factors related to horse meat acceptance are then analyzed, followed by motivations and finally by sociodemographic profiles.

3.1 Meat and horse meat consumption among the sample

The consumption frequencies of meat and horse meat among respondents are presented in table 1.

Among the sample, 44.2% claimed to eat meat on a daily basis and 41.9% several times a week. A majority of the respondents (83.8%) reported never eating horse meat. Nevertheless, among these non-consumers, 54% have already tasted horse meat, most during their

childhood (table 2).

Horse meat consumers totaled 16.2% of the sample. 14.2% stated eating horse meat less than once a month while only 2.0% reported a more frequent consumption. For consumers, preferred points of purchase were horse butcher shops (44.9%) and general butcher shops (33.3%), followed by supermarkets (30.4%) and direct purchase from producers (17.7%).

3.2 Description and characterization of the segments

Cluster analysis based on meat and horse meat consumption along with personal norm makes it possible to class respondents into four relatively homogeneous groups. Table 2 describes the segments based on these three classification variables. Mean scores to meat attachment are also presented to further characterize the four profiles in terms of psychological relation to meat in general.

Table 2. Description and characterization of the Segments (S) based on the classification variables and meat attachment scales

The **first segment** (16.2% of the sample) totaled the 78 respondents who reported eating horse meat on a more or less regular basis. With the highest mean score on personal norm towards horse meat (M=4.38), these consumers consistently expressed moral convictions that are not opposed to hippophagy. Compared to the other segments, they reported a significantly higher frequency of consumption of meat in general (3.60) as well as a greater psychological attachment to meat products (3.96). The other three segments included only non-consumers of horse meat who nevertheless presented distinct behavioral and psychological profiles. Non-consumers in **segment 2** were the largest cluster accounting for 36.2% of the sample. They were not morally opposed to hippophagy despite a slightly lower score on personal norm (4.00) than consumers in segment 1. With regards to meat in general, they reported a lower

296 frequency of meat consumption (3.49) than segment 1, but higher than segment 3 and

297 comparable to segment 4. Individuals of this group showed overall lower psychological
298 attachment to meat (3.74) than segment 1, despite similar scores on affinity and entitlement
299 subscales. Non-consumers in **segment 3** constitute the smallest group with 13.3% of
300 participants. Their average personal norm score (2.69), slightly below the scale's neutral point,
301 indicated a relatively moderate moral opposition to horse meat consumption. This segment is
302 clearly distinct from the other three segments in the relationship to meat. It showed the lowest
303 frequency of meat consumption (1.91) and the lowest psychological attachment to meat in
304 general (2.71). **Segment 4** was the second largest group with 34.2% of the participants. With
305 the lowest mean score on personal norm (1.79), these non-consumers expressed an obvious
306 moral opposition to hippophagy, stronger than those in Segment 3. At the same time, their
307 frequency of meat consumption (3.44) was similar to that of Segment 2, while mean meat
308 attachment scores (3.34) were above the neutral point as for Segments 1 and 2.
309 Based on these first elements, the 4 segments were named as follows. “Enthusiast” for
310 segment 1, consisting of the largest meat consumers, who morally accept and actually
311 consume horse meat. ***"Potential"*** *for the* second segment, which is composed of consistent
312 meat consumers who morally accept the consumption of horse meat but do not actually eat it.
313 ***"Distant"*** *for* segment 3, which includes the lowest meat consumers, who are neither for nor
314 against the consumption of horse meat but do not consume it . Finally, segment 4, composed
315 of consistent meat consumers who are morally opposed to horse meat and do not consume it,
3163 has been named ***"Aversive"***.
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318 ## 3.3 Factors related to horse meat acceptance

319 Means of the factors related to horse meat acceptance are presented in Table 3. In addition,
320 Appendix 1 and 2 provides the distribution of the answers to knowledge questions for the

overall sample and Figure 1 and Appendix 3 illustrate the average ratings of each attitudinal attribute across segments.

3.3.1 Disgust

Disgust towards horse meat significantly varied among segments (F=140.86; p<.001). Both *Enthusiast* (1.30) and *Potential* (1.97) showed a rather clear absence of disgust towards horse meat. Although less marked, with an average rating just below the neutral point 3, *Distant* tended to express low disgust (2.76). Only the *Aversive* segment recorded a mean score slightly above the neutral point (3.20) revealing a rather moderate form of disgust.

3.3.2 Knowledge

On 7 of the 9 knowledge questions, most participants answered "don't know" or gave an incorrect answer (see appendix 1). Although individuals know the color of horse meat (Q.6), nutritional properties (Q.3, 7 and 8), purchasing and consumption modalities (Q.1, 2, 4), environmental benefits (Q.9), as well as the origin of the meat (Q.9) are broadly unknown. This translated into a relatively low mean knowledge score (3.99) among the whole sample (Table 4). Nevertheless, compared to the other three groups, a significantly higher number of correct answers among the *Enthusiast* segment is found (F = 20.12; p<.001). This suggests that the lack of knowledge is a little less marked among consumers who are familiar with horse meat products.

3.3.3 Attitude

Respondent attitude towards horse meat was assessed through consumer perception on 8 horse meat attributes. First, the average score of all attributes (table 4) differs significantly between some of the groups (F=43.36, p<.001). *Enthusiast* garnered clear overall positive scores, *Potential* showed a slightly positive rating, while *Distant* and *Aversive* were similarly positioned on the neutral point of the scale. This means that, overall, the respondents tended to have a fairly positive or neutral attitude towards horse meat. However, significant differences in the evaluation of each attribute and between segments are noted (Fig 1.).

Figure 1. Attitude towards horse meat on 7-point semantic differential scale (from -3 to +3)

For all segments, “animal friendly” recorded the lowest score, indicating a shared concern for horse welfare and breeding conditions. Besides a negative attitude on the animal welfare attribute, *Distant* and *Aversive* also assessed negatively on the “trust” attribute. For *Enthusiast*, the highest rating was for "taste". It is also the attribute that illustrates the biggest difference between *Enthusiast* and the other groups, and the lowest attribute for *Potential*. This emphasizes that current consumers of horse meat appreciate its taste and poses the hypothesis that those in the *Potential* segment may change their opinion of the taste of horse meat if they were to try it. To develop this question further, we analyzed the attribute ‘taste’ within the *Potential* group, differentiating individuals who have never eaten horse meat from those who have already tried it. The mean comparison test revealed that within the *Potential* group, those who have tasted horse meat at least once in their life tend to have a more favorable evaluation of the taste attribute (.761) than individuals who have never tasted it (.032) ($t=-3.038$; $p<.005$).

For *Potential* and *Distant*, the highest attribute is ‘quality’ (it is the second highest for *Enthusiast* and *Aversive*). ‘Healthy’ is the highest attribute for *Aversive* and is also well scored (second or third) for the other groups. This illustrates that, despite a lack of precise knowledge of horse meat properties, its qualities and nutritional attributes are reasonably recognized among all groups.

3.3.4 Social norm and purchase facility

Social norm and purchase facility have been analyzed to assess to what extent external factors could favor or impede the acceptance and consumption of horse meat, and whether it differs among the four profiles.

Regarding social norm, none of the segments stated a high degree of peer pressure against horse meat consumption. *Distant* (3.00) and *Aversive* (2.87) scored close to the neutral point meaning relatively weak peer pressure surrounding horse meat consumption. *Enthusiast* and

375 *Potential* reported higher mean values above the threshold 3 (F=29.98, p<.001). For
376 *Enthusiast* (4.05), social norm was clearly perceived as supporting horse meat consumption,
377 while *Potential* (3.64) seemed to feel a more moderate supportive peer pressure.
378 In terms of purchase facility it appears that all segments expressed difficulty in finding outlets
379 for horse meat, with more widely expressed barriers among *Enthusiast*, *Potential,* and *Distant*
380 than among *Aversive* (F=4.23, p<.001). This clearly reflects the limited supply of horse meat
381 products on the common market place. This result is in line with previous research that
382 showed the lack of visibility and availability of horse meat as a main reason for non-
383 consumption (Lamy *et al.*, 2020; Lamy *et al.*, 2022).

384 3.3.5 Differences in motivations between the segments

385 Consumption intention within the next 6 months has been assessed to distinguish whether
386 motivations to eat horse meat vary among people according to different contexts.
387 Unsurprisingly, the average intention to eat horse meat differs significantly between the
388 segments (F=121.21, <.001). We consistently found higher intention for *Enthusiast*, weak
389 intention among *Potential* and no stated intention at all for *Distant* and *Aversive*. More
390 interestingly, we observed differences according to the context. First, for all segments,
391 canteens appeared to be the less motivating environment. For *Enthusiast*, home appeared to
392 be the most favorable setting (4.12), followed by restaurants (3.74) and peers' homes (3.58).
393 In contrast, for *Potential*, intention to eat at home was weak (2.18) but scored slightly higher
394 in a relative's home (2.94) or restaurant (2.64). These results suggest that out-of-home
395 situations could be a conducive environment for persuading certain non-consumers to
3963 experience and taste horse meat products.
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398 3.4 Sociodemographic profile of the segments

Table 4 presents the sociodemographic characteristics of the segments.

Table 4. Sociodemographic characteristics of the segments

There were no significant age differences across the segments. However, as compared to the distribution in the total sample, there were significantly more men among *Enthusiast* and *Potential,* and significantly more women in *Distant* and *Aversive* clusters. In addition, we observed that among *Potential* the proportion of individuals without children in their household is significantly higher than the distribution of the sample, unlike the *Aversive* group that has a higher proportion of households with children than the overall sample. In terms of education, *Enthusiast* shared a lower level of tertiary education (post-secondary and higher) compared to other segments as well as a lower proportion of students and a higher proportion of self-employed and business owners. These results are in line with previous research that studied French horse meat eaters' profiles and chiefly defined them as old men living in the North of France (Lamy *et al.*, 2020).

4 Discussion and conclusion

This study provides insights about horse meat consumption in France. In particular, we investigated whether consumers and non-consumers of this particular meat can be segmented based on their personal norms, attitude, motivations and behavior and on which aspects these segments differ. Our results have numerous implications for actors in the equine industry, retailers, marketers and researchers.

Among the sample, a significant proportion of individuals had already tasted horse meat, at least once in their lives, but only a minority includes this particular meat in their diet, and then only occasionally. This result is consistent with national data, which indicate that the consumption of horse meat in 2021 concerns approximately 7% of French households and represents 0.1% of meat purchases (Drapeau, 2022).

Among horse meat consumers, a vast majority favor horse butcher's shops and traditional butcher's shops for their supplies. However, to date, there are less than 750 specialized butcher shops in France and only 3.7% of traditional butchers offer horse meat (Lizet, 2010). It is therefore not surprising that individuals express difficulties in finding outlets for this meat. The weak availability is a major obstacle for actual consumers that are limited in their ability to purchase horse meat products, and also for non-consumers who, in the absence of a visible offer, do not consider this meat when shopping. Developing alternative distribution channels such as online sales or direct purchase from producers could favorably meet the needs of current consumers. Stimulating demand is also crucial to maintaining and supporting the horse meat market. Our results highlight a lack of knowledge about the horse meat industry and lower scores on attitudinal attributes such as trust and animal welfare. A first lever of action would therefore be to develop communication campaigns to inform about the benefits of this meat especially in terms of environment, breeding conditions and nutritional properties. However, by identifying 4 distinct profiles, our analysis shows that targeted strategies must be developed according to the individuals and their relationship with both meat in general and with horse meat.

Aversive and *Distant* are characterized by low acceptance of horse meat and thus appear as non-priority targets. *Aversive* are meat lovers, but they tend to consider horse meat as a separate meat category. For *Aversive*, hippophagy is opposed to their moral values and is associated with an increased feeling of disgust compared to the other groups. These results are consistent with traditional approaches to moral reasoning and emotion which claim that conceptualizing meat eating as immoral creates an opportunity and an incentive to view meat as disgusting (Rozin et al., 1997). It seems difficult to overcome this psychological barrier even by presenting horse meat as a more sustainable option to beef or by emphasizing good farming conditions. For the *Aversive* segment the aim is therefore to avoid hostile reactions that could damage the image of the product. Similarly, *Distant* is not a promising segment.

The profile of these respondents suggests that horse meat is part of an overall more distant attachment with meat in general. For this group, it can be assumed that the promotion of other sources of protein such as plant-based foods would strike more of a chord than the promotion of a meat with a low carbon impact.

Enthusiast and *Potential* are the two priority segments for the development of the horse meat market. For *Enthusiast*, who are already consumers, their level of knowledge about the product and their positive attitude towards it suggest that a communication strategy alone may not be sufficient. For these individuals, the main obstacle is the characteristics of the offer and more precisely its accessibility. Promoting the presence and visibility of the product in distribution channels is a priority in order to increase consumption opportunities.

The *Potential* segment does not eat horse meat but is not morally opposed to hippophagy. Interestingly, among this group, those who have already consumed this meat at least once tend to evaluate its taste more favorably. This supports the idea of increasing the frequency of horse meat exposure and experimental tasting. In the light of the consumption intentions stated by this group, the context of commercial catering appears to be a privileged space to incite the (re)discovery of this product. In a very competitive catering market, offering horse meat can be an element of differentiation capable of arousing the curiosity of potential consumers while meeting the expectations of current horse meat lovers. For actors of the horse meat sector, this implies a Business to Business strategy addressed to catering professionals, with the main target being brands positioned on meat such as steakhouses.

In order to avoid possible controversies and to encourage the choice of the product within the menu, it would be interesting to test the effects of different information content (origin of the product and rearing conditions, environmental benefits, nutritional and organoleptic qualities) and distribution methods (information delivered by the waiter versus posted on the menu) on the acceptance of the product and the intention to consume it in the restaurant. In addition, insofar as the restaurant sector seems to be a promising distribution channel, it would be

advisable to conduct investigations among chefs and cooks in order to take into account their motivations and barriers with respect to the product.

This work sheds light on the different profiles of consumers and non-consumers of horse meat. However, the size of the sample, its low representativeness of the French population, and the over-representation of women, younger people and individuals from higher professions, suggest caution in generalizing the results obtained. Indeed, since these three profiles are traditionally associated with lower horse meat consumption (Lamy *et al.*, 2020), it is reasonable to believe that our results could underestimate the number of *Enthusiasts* and *Potentials*. Therefore, a new data collection from a representative sample of the French population would be useful.

Nevertheless, the focus on horse meat offers an original perspective for several reasons. Firstly, it makes it possible to analyze the acceptance of an alternative source of protein that has environmental and health benefits. Secondly, horse meat is an ambivalent food that for the most part remains unexamined and is associated with strong emotional and moral issues. It is consequently an extreme case that can shed light on common issues for other meat: alternative new meat such as kangaroos or ostriches, meat from production animals that are also pets (e.g., rabbits), meat from animals that arouse emotional attachment (e.g.,lamb) and uncommon meat (e.g, snails, frogs). More generally, in the current trend in western societies of controversy surrounding animal welfare and meat consumption, these results provide insight into the future for meat in general. In a perspective of sustainable diet, the diversification of protein sources is a major challenge. This will only be possible by adapting the products on offer to the various population targets, improving product availability and visibility, and by adapting communication, which highlights the benefits of these products in

terms
of
health,
environ
ment,
and
animal
welfare
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674 **Table 1. Characteristics of the valid sample (% of respondents, n=482)**

Gender		
	Male	29.4
	Female	70.5
	Gender diverse	0.1
Age		
	18-25 years	19.7
	26-35 years	27.2
	36-45 Years	17.6
	46-55 years	17.2
	56-64 years	11.0
	>65 years	7.3
	Mean	40.0
	(S.D)	(15.1)
Education		
	Upper secondary and lower	13.7
	Post-secondary and higher	86.3
Employment status		
	Student	16.2
	Self-employed and business owner	5.4
	Employed	22.0
	Executive and higher profession	46.7
	Retired	7.9
	Unemployed	1.9
Frequency of meat consumption		
	Less than once a month	1.5
	More than once a month	12.4
	More than once a week	41.9
	Daily	44.2
Frequency of horse meat consumption		
	Less than once a month	14.2
	More than once a month	1.0
	More than once a week	1.0
	Never	83.8
	Never but already tasted	*54.0*
	During childhood	*77.0*
	During adulthood	*23.0*

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676

Table 2. Description and characterization of the Segments (S) based on the classification variables and meat attachment scales

	Sample		S.1 Enthusiast		S.2 Potential		S.3 Distant		S.4 Aversive		F-Value	p-Value
Sample size (%)	482	(100)	78	(16.2)	175	(36.3)	64	(13.3)	165	(34.2)		
Number of horse meat consumers	78		78		0		0		0			
	M	S.E	M	S.E	M	S.E	M	S.E	M	S.E		
Personal norm[1]	3.13	1.29	4.38 a	0.70	4.00 b	0.64	2.69 c	1.06	1.79 d	0.56	386.66	<.001
Meat consumption[2]	3.29	0.74	3.64 a	0.6	3.49 b	0.5	1.91 c	0.29	3.44 b	0.5	193.49	<.001
Meat attachment [1]	3.5	0.85	3.96 a	0.85	3.74 b	0.68	2.70 d	0.73	3.33 c	0.82	40.35	<.001
Hedonism	*3.65*	*1.01*	*4.19 a*	*0.85*	*3.88 b*	*0.84*	*2.69 d*	*0.93*	*3.54 c*	*0.98*	*37.1*	*<.001*
Affinity	*4.02*	*0.91*	*4.42 a*	*0.76*	*4.33 a*	*0.68*	*3.39 c*	*1.02*	*3.74 b*	*0.9*	*32.59*	*<.001*
Entitlement	*3.35*	*1.12*	*3.70 a*	*1.2*	*3.55 a*	*0.99*	*2.75 c*	*1.09*	*3.20 b*	*1.1*	*12.3*	*<.001*
Dependence	*2.94*	*1.05*	*3.43 a*	*1.1*	*3.17 b*	*0.93*	*2.02 d*	*0.81*	*2.83 c*	*0.98*	*30.33*	*<.001*

[1] 5-point Likert scale (from 1 to 5) ; [2] 5-point frequency scale (from 0 'never' to 4 'every day') ; a; b; c, d, Scores in one row with a different superscript are significantly different at $p < 0:05$ (one-way ANOVA and post hoc Tukey multiple comparison test).

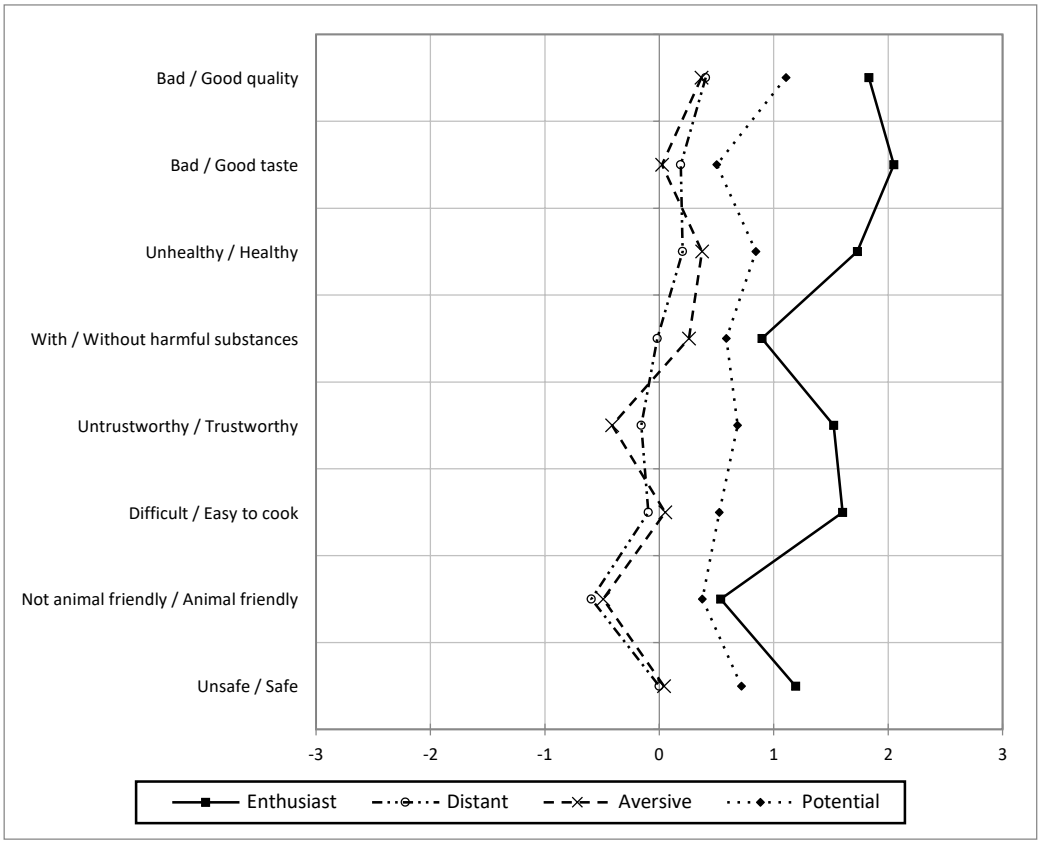
Table3. Factors related to horse meat acceptance

	Sample		Enthusiast		Potential		Distant		Aversive		F-Value	p-Value
	M	S.E	M	S.E	M	S.E	M	S.E	M	S.E		
Disgust [1]	2.39	1.03	1.30 d	0.46	1.97 c	0.76	2.76 b	1.00	3.20 a	0.75	140.86	<.001
Knowledge [2]	3.99	2.34	5.68 a	2.01	3.96 b	2.25	3.23 c	1.87	3.52 bc	2.35	20.12	<.001
Attitude [3]	0.48	1.10	1.42 a	1.17	0.67 b	0.88	-0.01 c	1.17	0.03 c	0.90	43.36	<.001
Social norm[1]	3.36	1.05	4.05 a	0.12	3.64 b	0.08	3.00 c	0.13	2.87 c	0.08	29.98	<.001
Purchase facility[1]	3.82	0.96	4.04 a	0.81	3.89 a	0.90	3.94 a	0.82	3.60 b	1.08	4.23	0.001
Intention [1]	2.10	1.22	3.52 a	1.00	2.45 b	1.20	1.57 c	0.84	1.27 d	0.56	121.21	<.001
Home	2.05	1.47	4.12 a	1.29	2.18 b	1.35	1.40 c	0.91	1.20 c	0.63	134.69	<.001
Relatives, Friends and family	2.41	1.50	3.58 a	1.33	2.94 b	1.46	2.03 c	1.36	1.43 d	0.90	66.25	<.001
Restaurant	2.22	1.44	3.74 a	1.30	2.64 b	1.41	1.67 c	1.13	1.27 d	0.66	94.77	<.001
Canteen	1.57	1.06	2.27 a	1.43	1.86 b	1.23	1.12 c	0.38	1.10 c	0.41	34.19	<.001

[1] 5-point Likert scale (from 1 to 5) ; [2] average number of correct responses to 9 knowledge questions; [3]average score derived from the 8 average attributes rated on 7-point semantic differential scale (from -3 to +3) a; b; c, d, Scores in one row with a different superscript are significantly different at $p < 0:05$ (one-way ANOVA and post hoc Tukey multiple comparison test).

688

689 **Figure 1. Attitude towards horse meat on 7-point semantic differential scale (from -3 to +3)**



690

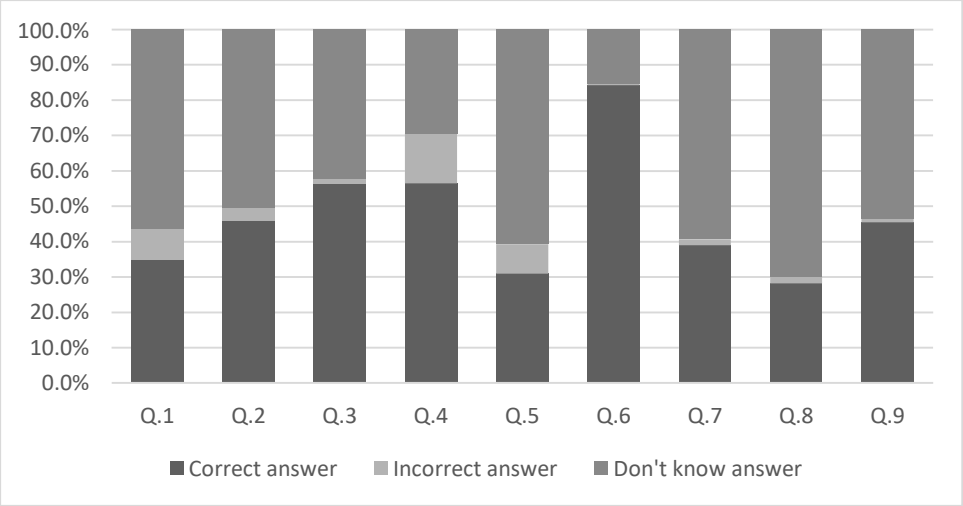
691 **Table 4. Sociodemographic characteristics of the segments**

	Sample	Enthusiast	Potential	Distant	Aversive	F-Value[1] /χ^2	p-Value
Age (Mean) [1]	40.1	42.64 a	40.82 ab	37.28 b	39.36 ab	1.73	.16
Gender (%)						37.35	<.001
Female	70.8	**50.0***	**64.0***	**82.3***	**83.6***		
Male	29.2	**50.0***	**36.0***	**17.7***	**16.4***		
Presence of children in the household (%)						9.245	.026
NO	68	62.8	73.7	76.6	**61.2***		
YES	31	37.2	**26.3***	23.4	**38.8***		
Education (%)						10.97	.012
Upper secondary and lower	13.7	**24.4***	10.9	17.2	10.3		
Post-secondary and higher	86.3	**75.6***	89.1	82.8	89.7		
Employment status (%)						28.88	.017
Student	16.2	**9.0***	18.3	25.0	13.9		
Self-employed and business owner	5.4	**11.5***	5.1	3.1	3.6		
Employed	22.0	23.1	**15.4***	18.8	**29.7***		
Executive and higher profession	46.7	44.9	49.7	43.8	45.5		
Retired	7.9	10.3	10.3	7.8	**4.2***		
Unemployed	1.9	1.3	1.1	1.6	3.0		

[1]F-value for the age (average), χ^2 for other tests**Appendix 1** Knowledge questionnaire

Questions	**Correct answer**
Q1.Horse meat can be eaten raw	TRUE
Q2.Horse meat is allowed in traditional restaurants	TRUE
Q3.Horse meat is more fatty than beef	FALSE
Q4.Horse meat is only sold in horse butcher shops	FALSE
Q5.Horse meat consumed in France is mostly of foreign origin	TRUE
Q6.Horse meat is a white meat	FALSE
Q7.Horse meat is less rich in iron than beef	FALSE
Q8.Horse meat contains more good fats than beef (more omega 3 and 6 and a better proportion of unsaturated fatty acids)	TRUE
Q9.A horse emits more greenhouse gases than a bovine	FALSE

Appendix 2. Proportion of correct, incorrect and "don't know" answers among the sample



Appendix 3. Attitude towards horse meat on 7-point semantic differential scale (from -3 to +3)

	Sample		Enthusiast		Potential		Distant		Aversive		F-Value	p-Value
	M	S.E	M	S.E	M	S.E	M	S.E	M	S.E		
Attitude	0.48	1.10	1.42 a	1.17	0.67 b	0.88	-0.01 c	1.11	0.03 c	0.91	43.36	<.001
Bad / Good quality	*0.88*	*1.48*	*1.83 a*	*1.44*	*1.11 b*	*1.24*	*0.41 c*	*1.42*	*0.37 c*	*1.46*	*23.96*	*<.001*
Bad / Good taste	*0.55*	*1.70*	*2.05 a*	*1.52*	*0.50 b*	*1.55*	*0.19 bc*	*1.62*	*0.02 c*	*1.45*	*32.89*	*<.001*
Unhealthy / Healthy	*0.74*	*1.56*	*1.73 a*	*1.71*	*0.85 b*	*1.45*	*0.20 c*	*1.35*	*0.38 c*	*1.44*	*17.98*	*<.001*
With / Without harmful substances	*0.45*	*1.55*	*0.90 a*	*1.82*	*0.59 a*	*1.52*	*-0.02 b*	*1.40*	*0.26 b*	*1.43*	*5.50*	*0.001*
Untrustworthy / Trustworthy	*0.33*	*1.64*	*1.53 a*	*1.71*	*0.69 b*	*1.37*	*-0.16 c*	*1.57*	*-0.41 c*	*1.46*	*35.9*	*<.001*
Difficult / Easy to cook	*0.46*	*1.47*	*1.60 a*	*1.64*	*0.53 b*	*1.25*	*-0.09 c*	*1.39*	*0.05 c*	*1.30*	*26.79*	*<.001*
Not animal friendly / Animal friendly	*-0.02*	*1.53*	*0.54 a*	*1.60*	*0.38 a*	*1.32*	*-0.59 b*	*1.50*	*-0.49 b*	*1.52*	*16.97*	*<.001*
Unsafe / Safe	*0.47*	*1.52*	*1.19 a*	*1.55*	*0.72 b*	*1.43*	*0.00 c*	*1.63*	*0.04 c*	*1.36*	*14.98*	*<.001*

[a; b; c, d,] Scores in one row with a different superscript are significantly different at p < 0:05 (one-way ANOVA and post hoc Tukey multiple comparison test).

Author statement

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- All authors have approved the manuscript and agree with its submission to *International Journal of Consumer Studies,*
- 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.

DATA AVAILABILITY STATEMENT

Data available on request from the authors