Food Quality and Preference 131 (2025) 105567

Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

The eyes eat first: Improving consumer acceptance of plant-based meat alternatives by adjusting front-of-pack labeling

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ARTICLE INFO

Keywords:
Best-worst scaling
Consumer segmentation
Discrete choice
Food labels
Plant-based meat
Willingness-to-pay

ABSTRACT

The substitution of meat products with plant-based meat (PBM) alternatives is seen to foster sustainable consumption. It can play an important role in helping reach greenhouse gas emission targets. While consumers generally perceive PBM alternatives as more environmentally friendly and healthier than meat, they often find them less hedonically appealing and too expensive, which hinders their widespread adoption. One effective strategy to encourage consumers toward more sustainable choices is the use of front-of-pack information, such as claims and labels. This study identifies the most effective labeling strategy to increase consumers' preference for PBM burger patties through a three-fold research approach, namely, a supermarket audit in the UK, a best-worst scaling study (i.e., Maximum Difference Scaling), and a discrete choice experiment (i.e., choice-based conjoint analysis). In the UK market, front-of-pack labels and claims presented on PBM products can be categorized into those primarily related to nutrition, ecological welfare, and taste. These categories correspond to three distinct consumer segments extracted from a best-worst scaling study. A subsequent discrete choice experiment, which compared labeled PBM patties vis-à-vis meat patties, revealed that a third-party accredited taste label has the potential to gain the highest market share and willingness-to-pay among all types of labels/claims. Our findings underscore the importance of adopting an appropriate labeling strategy to foster sustainable food consumption.

1. Introduction

Plant-based meat (PBM) alternatives are becoming increasingly popular because of heightened awareness regarding the ethical, environmental, and health issues tied to meat consumption (Boukid, 2021; Jahn et al., 2021). Made from non-animal protein sources such as cereals, vegetables, legumes, microalgae, and fungi, these products resemble traditional meat products such as hamburgers or sausages. The PBM market grew rapidly toward the end of the last decade, but recent years have been characterized by stagnating sales and the discontinuation of products. Market analysts attribute this to product saturation and duplication, which is often associated with a new and hyped market as manufacturers and retailers rush to diffuse new products onto supermarket shelves (Terazono & Evans, 2022). Therefore, brands should enhance their target marketing by deeply understanding consumer preferences.

PBM alternatives primarily attract consumers looking to reduce meat consumption (Bryant, 2022; Curtain & Grafenauer, 2019). A recent pan-European survey found that one in two meat eaters claim to be reducing their meat intake, and 27 % of consumers identify as flexitarians, which means they intend to cut down on meat and consume a larger proportion of plant-based foods (Smart Protein, 2023). In this regard, PBM alternatives can assist governments in achieving their greenhouse gas emissions targets by serving as a pathway for meat eaters to adopt a more sustainable diet (Dagevos & Voordouw, 2013) – a win-win situation for consumers, government policymakers, and those involved in marketing PBM products. Life cycle assessment studies have reaffirmed that PBM alternatives have a much lower environmental footprint than meat (Boukid, 2021). From a nutritional standpoint, these products typically contain fewer calories and less fat while offering more fiber than the meat they aim to replicate (Bohrer, 2019; Curtain & Grafenauer, 2019). Adding fortification ingredients such as minerals, amino acids, and vitamins enhances their nutritional value. However, many PBM alternatives are ultra-processed, and although they contain protein and iron levels comparable to traditional meat products these nutrients are less bioavailable (Xie et al., 2024). Notwithstanding the debated evidence, consumers generally perceive PBM alternatives as healthier than meat (Ketelings et al., 2023; Michel et al., 2021; Oliveira Padilha et al., 2022).

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https://doi.org/10.1016/j.foodqual.2025.105567
Received 21 November 2024; Received in revised form 3 April 2025; Accepted 27 April 2025
Available online 28 April 2025

Despite the perceived ecological and health benefits, a recent survey of UK consumers revealed that 34 % intended to limit or stop consuming PBM alternatives due to price and taste appraisals (Bryant Research, 2023). This aligns with other studies that highlight negative taste perceptions and high prices as major barriers to PBM consumption (Bryant & Sanctorum, 2021; Jahn et al., 2024; Weinrich, 2019). Moreover, a strong attachment to meat, a cultural tendency to compose meals around meat, a lack of product familiarity, and food neophobia serve as additional barriers to acceptance (Jahn et al., 2021).

Building on extensive consumer research into PBM alternatives, our study explores consumer preferences for the credence and non-credence cues presented on front packaging in an exploratory manner. While several studies have investigated consumer preferences for PBM alternatives (e.g., Apostolidis & McLeay, 2016; Giezenaar et al., 2024; van Loo et al., 2020), and the influence of product claims on purchase intention for PBM restaurant dishes (Erhard et al., 2024), to our knowledge, no study has examined the most effective labeling strategy to enhance their appeal in retail. Food product and marketing research generally support the efficacy of food labels in changing consumers' purchasing behavior, provided that these labels are consistent, credible, and relevant (see, e.g., Brown et al., 2020; Carneiro et al., 2025; Francesco Mazzù et al., 2025). Research also indicates that labels significantly impact consumers' buying decisions more than tax policy alterations (Crosetto et al., 2025). Our study adopts an empirical-first approach (Golder et al., 2023) to evaluate the relative efficacy of different labeling strategies for plant-based burger patties, the most prominent PBM alternative product category that is projected to grow further (Caputo et al., 2024; Smart Protein, 2023). This paper offers four key insights for readers: first, we identify and systematize the labels and claims used in the UK market. Second, we show which kind of front-of-pack (FoP) information consumers prefer most. Third, we uncover three distinct consumer segments holding preferences for different FoP information. Finally, we highlight which FoP labeling strategy has the highest potential to draw market share from meat competitors. The analysis also includes consumers' willingness-to-pay (WtP) for different FoP information. In conclusion, the insights from this study are valuable for developing labeling-based food strategies to encourage consumers to adopt more PBM alternatives. In addition, we aim to inspire the formulation of hypotheses regarding the (in)effectiveness of specific labels and claims in promoting PBM alternatives among various consumer groups.

2. Theoretical framework

Generally, product preference results from an evaluation process that considers perceptions of product attributes and their significance (Chernev, 1997). Faced with 200 to 300 food decisions daily (Johnson et al., 2012), the average consumer is assumed to apply a limited information search, relying instead on decision-making shortcuts (i.e., heuristics) to simplify and expedite the choice process (Missbach & König, 2016; Romero & Biswas, 2016). Cue utilization theory offers a framework for understanding how consumers evaluate products (Olson & Jacoby, 1972). According to this theory, a product is the sum of various attributes conveyed through cues. A food product, for example, can be evaluated based on intrinsic cues such as taste, aroma, and texture, as well as extrinsic cues like brand name, price, packaging, and labeling (see, e.g., Gaviglio et al., 2014). While the former greatly influences food preferences and consumption experience, the latter plays a crucial role in assessing credence attributes—product characteristics that consumers find challenging to evaluate even after purchase and use (Caswell & Padberg, 1992; Miyazaki et al., 2005; Northen, 2000). Examples include nutrition information, which is often highlighted on product packaging with claims such as *high in protein* or *low in saturated fat*. Nutrition claims do not communicate potential health benefits linked to a specific nutrient, yet they can still create a positivity bias toward a product (see, e.g., Oostenbach et al., 2019). Additionally, process attributes (such as animal welfare or sustainability) are not easily verifiable by consumers even after purchase but can be communicated through ecological welfare labels (e.g., a vegan label; Weinrich & Spiller, 2016). Even intrinsic attributes that can be assessed after purchase, such as taste, may be emphasized on product packaging, especially for new or unfamiliar products. Research indicates that a taste claim can positively affect not only consumers' taste expectations for a product but also the actual taste experience (Bialkova et al., 2016).

The abundance of information on front packaging can be confusing and unappealing for consumers, particularly if the labels are unfamiliar and seem to lack credibility (Sirieix et al., 2013). Beyond Meat's Beyond Burger package, for example, contains the grams of protein per serving, a *High Protein* claim, and a *Vegetarian Society Approved Trademark* label. In contrast, the plant-based burger by *This Isn't Beef* states that it is *100 % plant-based* and has an uncertified taste claim (i.e., '*FYI, This is now even tastier*'). An audit of 137 PBM products sold in Australia found that 60 % displayed a protein content claim and 15 % displayed a low-fat claim (Curtain & Grafenauer, 2019). In comparison, a pan-European study on pre-packaged foods discovered that only 10 % of meat products included any nutrition claim (Hieke et al., 2016), which demonstrates the difference between familiar and unfamiliar product categories.

Several studies have examined consumer preferences for meat and meat alternatives, focusing on the impact of attribute information. Product type (e.g., beef, chicken, plant-based, etc.) is identified as the most significant consideration for consumers, with PBM being the least preferred option on average (Apostolidis & McLeay, 2016, 2019; Giezenaar et al., 2024). For consumers looking to reduce their meat consumption, such as flexitarians, the type of product is less important than it is for meat eaters and vegetarians, who are more committed to their preferences (Apostolidis & McLeay, 2019). Other important factors influencing consumer preferences include price and nutritional information, while environmental information plays a lesser role (Apostolidis & McLeay, 2019; Giezenaar et al., 2024; Jahn et al., 2024). This finding aligns with research indicating that environmental information and FoP climate labels have a relatively minor effect on consumers' willingness to switch from meat to PBM alternatives (Carlsson et al., 2022; Edenbrandt & Lagerkvist, 2021; van Loo et al., 2020).

The present study seeks to enhance the understanding of manufacturers, retailers, and academics regarding consumer preferences for PBM alternatives. It makes several contributions to the existing literature. Firstly, it clarifies the extensive FoP information used to describe PBM burger patties in the UK market. Utilizing cue utilization theory, study 1 investigates how various consumer segments prioritize different information cues to align with their consumption goals. Building on these findings, study 2 analyzes FoP information in the form of labels and claims to assess market demand for products and consumers' WtP. To our knowledge, this is the first study to examine and compare a combination of FoP labels and claims related to nutrition, ecology, and taste attributes. Furthermore, no prior research has investigated preferences for taste labels or claims, despite brands utilizing these cues to alleviate negative perceptions regarding the sensory appeal of these products compared to meat.

3. Study overview and preliminary online market audit

As a preliminary study, we performed an online market audit of the eight largest UK supermarkets, which represent 72 % of the market share (IBISWorld, 2024). The goal was to identify the most common classes of FoP labels and claims and to gain a better understanding of the current labeling strategies. We used several keywords to capture all relevant products, such as 'plant-based burgers/patties' and 'vegan burgers/patties' (see Table A1 in the Appendix). Among the identified labels, some exclusively focus on nutrient content (e.g., *high in protein*, *low in saturated fat*), some consider the hedonic dimension of taste (e.g., a certified *Great Taste* label or an uncertified taste claim), while others

mainly deal with ecological issues (e.g., *carbon footprint*). Additionally, some labels convey a blend of benefits without exclusively addressing a specific issue (e.g., 100 % plant-based/ vegan may indicate both ecological welfare and nutrition-related benefits).

The findings from the online market audit were used to design a BWS case 1 online study (study 1). Study 1 asked participants to identify the most and least important attributes they consider when purchasing a PBM product, enabling the ranking of information based on its significance. The advantage of BWS is that it requires participants to make trade-offs between choices (Finn & Louviere, 1992), which eliminates the possibility of the participants stating that everything is important, as in classical rating questions. For this reason, studies on food preferences often implement BWS (e.g., Lagerkvist et al., 2012; Llobell et al., 2025; Schuster et al., 2024).

The BWS results were used to guide the selection of a subset of key information that is translated into labels and claims that can serve as visual cues for consumers (i.e., cue utilization theory; e.g., Gaviglio et al., 2014; Olson & Jacoby, 1972). These labels and claims were placed on unbranded product packages along with price information in an online discrete choice experiment (DCE, study 2). In addition, participants could choose a conventional unbranded meat patty or a no-buy option. Informed consent was obtained from participants for both studies. The goal was to identify FoP labels and claims that increase the purchase likelihood of PBMs. A field study or secondary data analysis would have been less suitable for answering this research question since, in the range of existing PBMs, labels and claims are highly correlated with other factors such as price or brands. To overcome these limitations, study 2 varied FoP information independently from product price and specific brands in an online DCE. This allows for an unbiased assessment of the power of various options to provide FoP cues in attracting consumers to the PBM alternatives category. Furthermore, DCEs mimic buying situations as closely as possible (e.g., Louviere & Woodworth, 1983; Sablotny-Wackershauser et al., 2024) enhancing ecological validity. The Ethics Committee of Edinburgh Napier University approved the methodological procedure (project ID 2939976). The data and analysis scripts are available in an open science framework repository (OSF; Naughton, Schramm, & Lichters, 2025).

4. Study 1

4.1. Material and methods

Study 1 explores the significance of 11 labels/claims identified in the supermarket audit (see Table 1 for an overview) using an online BWS case 1 design. Specifically, participants were asked what product information they seek when purchasing a PBM patty. They responded to a series of choice tasks that included five product attributes presented in textual form. From these attributes, they selected the most and least important factors when purchasing PBM patties in a retail store (see Fig. A1 in the Appendix for an example of a BWS task). A balanced incomplete block design was created using the open-source software *R* (Aizaki & Fogarty, 2023; R Core Team, 2024). Thus, each participant completed the same set of 11 BWS tasks in a randomized order to control for potential order effects. Additionally, participants answered questions regarding their diet, consumption of meat and PBM alternatives, and familiarity with PBM alternatives. They also completed an attention check.

Table 1
Best-worst scaling items of study 1.

Item	Item
Certified vegan	Low in saturated fat
Fortified with vitamin B12 & iron	Made with organic ingredients
Great Taste[1]	No artificial colors or flavors
Gluten-free	Packaging claims 'Tastes even meatier'[2]
High in fiber	Total carbon footprint
High in protein	

Note: [1] branded taste claim | [2] unbranded taste claim.

4.2. Participants

A representative sample from the UK with respect to gender and age was recruited via Prolific. Participants who did not pass the attention check ($n = 13$) were excluded from the subsequent analyses, resulting in a net sample size of $N = 587$ (52 % female, 47 % male, and 1 % non-binary; $M_{age} = 41.77$, $SD_{age} = 14.73$; Table 2 presents demographics for study 1 and study 2). The majority of participants follow an

Table 2
Demographics for study 1 and study 2.

Specification	Study 1 BWS	Study 2 DCE
N	587	440
Gender		
Male	47.4 %	47.3 %
Female	52.0 %	51.8 %
Non-binary	0.5 %	0.7 %
Prefer not to say	0.2 %	0.2 %
Age		
Mean (M)	41.77	46.04
Standard deviation (SD)	*14.73*	*15.78*
Education		
No Formal Qualifications	1.0 %	1.8 %
1–4 GCSEs	5.1 %	6.6 %
5–8 GCSEs	9.5 %	11.1 %
Apprenticeship	2.4 %	3.0 %
2 or more A-levels	15.7 %	18.6 %
First or higher degree, professional qualifications	62.7 %	54.3 %
Other vocational / work-related qualifications	3.1 %	3.6 %
Other	0.5 %	0.9 %
Diet [1]		
Vegetarian	9.2 %	7.7 %
Vegan	3.1 %	2.3 %
Omnivore	59.8 %	65.7 %
Flexitarian	21.0 %	20.7 %
Pescatarian	2.7 %	3.6 %
None of the above	4.3 %	/
Meat consumption [2]		
Less than once per week	3.1 %	3.0 %
Once or twice per week	18.2 %	22.3 %
Three or four times per week	23.0 %	24.3 %
Five or six times per week	26.2 %	22.7 %
Everyday	10.2 %	14.1 %
Missings	19.2 %	13.6 %
Familiarity with PBM alternatives [3]		
Not familiar at all	3.8 %	5.2 %
Slightly familiar	27.8 %	21.1 %
Moderately familiar	31.0 %	30.4 %
Very familiar	24.7 %	27.7 %
Extremely familiar	12.8 %	15.4 %
Consumption of PBM alternatives [3]		
Never	24.7 %	23.4 %
Less than once per month	23.3 %	24.6 %
Once or twice per month	19.9 %	21.1 %
Once or twice per week	22.2 %	21.1 %
Three times or more per week	9.9 %	9.8 %
Consumption of meat burgers [4]		
Never	/	18.6 %
Less than once per month	/	35.5 %
Once or twice per month	/	36.1 %
Once or twice per week	/	9.3 %
Three times or more per week	/	0.5 %
Consumption of PBM burgers [4]		
Never	/	40.2 %
Less than once per month	/	34.1 %
Once or twice per month	/	20.2 %
Once or twice per week	/	5.5 %
Three times or more per week	/	/

Note: [1] forced choice in study 2 | [2] only shown to omnivores and flexitarians | [3] PBM alternatives in general | [4] only asked in study 2.

omnivorous diet (59.80 %) and regularly consume meat (almost 60 % report eating meat at least three or four times a week).

4.3. Utility model estimation and segmentation

Given the random utility model, participant *n* chooses the alternative with the highest utility (i.e., "utility-maximizing behavior"; Train, 2009, p. 11). The utility for a given alternative *j*, which is composed of a deterministic and a random error part, is calculated according to (Train, 2009, p. 34):

$$U_{nj} = V_{nj} + \varepsilon_{nj},$$

while the deterministic part, $V_{n,j}$, is defined as (Train, 2009, p. 137):

$$V_{nj} = \beta'_n x_{nj},$$

where $x_{n,j}$ describes presence/absence of the choice alternative *j* and β'_n are the participants' utilities for the most-liked (disutility for the worst-liked) FoP information (Apostolidis & McLeay, 2016; Train, 2009, p. 137).[1]

The choice behavior was modeled using the best-worst coding approach (Chrzan & Orme, 2019, pp. 20–22). The Appendix provides more details (see Table A2). We implemented a hierarchical Bayes (HB) multinomial logit analysis with a single multivariate normal distribution (Allenby & Ginter, 1995) to account for preference heterogeneity. The HB estimation was run in *R* using the *ChoiceModelR* package (Sermas et al., 2022), using 120,000 iterations, of which 40,000 were used for warm-up purposes. We averaged the remaining 80,000 steps to create the point estimates (every tenth draw was saved to prevent autocorrelation). The raw logit utilities were normalized into choice probabilities for better interpretability (Chrzan & Orme, 2019, Chapter 5) using the validateHOT package (Schramm & Lichters, 2025). To segment participants based on the obtained raw utilities, we applied the clustering around latent variables approach (Vigneau et al., 2001), as commonly done in studies on food preferences (see, e.g., Lichters et al., 2021). The final consumer segmentation consists of three segments (refer to Fig. A2 in the Appendix for more details).

4.4. Results

Table 3 shows the average total choice probabilities as well as those across the three segments, while Table 4 illustrates their socio-demographics.[2]

An additional multidimensional scaling (MDS) using the *smacof R* package (Mair et al., 2022) on the participants' choice probabilities further helps interpret the results (Fig. 1). The resulting MDS solution demonstrated a satisfactory fit with a stress value of .25, which a permutation test indicated is significant ($p < .001$).

Overall, consumers prefer information on the nutrition content the most, especially those indicating *high protein* content, followed by *low in saturated fat*, and *high in fiber*. Information on whether the product is gluten-free is the least important. The largest segment ($n = 288$) is mainly interested in nutrition information about the product when purchasing PBM; therefore, we named this segment '*health-orientated*'.[3] This segment has an average age of 42.40 years (SD = 15.29) and primarily comprises omnivores (63 %). Consumers in this segment show a much stronger preference for meat, with 65 % consuming it at least three to four times a week, compared to PBM alternatives, which 53 % consume never or less than once a month. Flexitarians are more likely to belong to this segment (53 %) than to the second segment, named '*eco-orientated*' (28 %), and the third segment, named '*taste-orientated*' (20 %).

Table 3
Choice probabilities by consumer segments from study 1.

	All (N = 587)	Health-orientated (*n* = 288) 49 %	Eco-orientated (*n* = 156) 27 %	Taste-orientated (*n* = 143) 24 %	F
High in protein (N)	17.92 % (7.85 %)	20.85 % (5.64 %)	15.29 % (8.38 %)	14.90 % (8.91 %)	45.23***
Low in saturated fat (N)	13.08 % (8.19 %)	16.58 % (7.11 %)	9.97 % (7.68 %)	9.41 % (7.81 %)	62.94***
High in fiber (N)	11.74 % (7.79 %)	16.55 % (6.40 %)	6.88 % (5.44 %)	7.35 % (6.55 %)	170.75***
Fortified with vitamin B12 & iron (N)	10.61 % (7.87 %)	14.11 % (7.06 %)	7.45 % (7.05 %)	7.02 % (7.18 %)	68.83***
No artificial colors or flavors (N)	10.11 % (7.69 %)	10.64 % (7.51 %)	11.17 % (7.72 %)	7.90 % (7.63 %)	8.26***
Made with organic ingredients (E)	9.88 % (8.45 %)	8.17 % (7.23 %)	15.94 % (8.46 %)	6.71 % (7.38 %)	69.10***
Great Taste (T)	8.75 % (9.91 %)	4.36 % (6.47 %)	4.95 % (7.18 %)	21.71 % (6.35 %)	361.43***
Certified vegan (E)	6.85 % (8.81 %)	2.55 % (4.38 %)	16.02 % (8.69 %)	5.50 % (8.18 %)	204.34***
Total carbon footprint (E)	5.40 % (6.93 %)	2.67 % (4.09 %)	9.37 % (7.99 %)	6.56 % (7.78 %)	60.20***
Packaging claims 'Tastes even meatier' (T)	3.50 % (7.31 %)	0.84 % (2.70 %)	0.52 % (1.86 %)	12.09 % (10.17 %)	235.95***
Gluten-free (N)	2.18 % (5.09 %)	2.70 % (5.27 %)	2.43 % (5.64 %)	0.85 % (3.70 %)	6.68**

Note: Standard deviations in parentheses | E = rather related to ecological issues | N = rather nutrition related | T = rather taste related.
***$p < .001$, **$p < .01$, *$p < .05$.

Consumers in the '*eco-orientated*' segment ($n = 156$) mainly prefer product information related to ecological issues (i.e., *certified vegan*, *made with organic ingredients*, and *total carbon footprint*). Compared to the other two segments, this segment has the highest proportion of vegetarians and vegans, with 89 % of participants on a vegan diet belonging to this segment and 46 % of those following a vegetarian diet. This accounts for the segment's strong consumption of PBM alternatives, as 65 % consume them at least monthly and 48 % do so weekly. The mean age for the '*eco-orientated*' segment is 43.41 years (SD = 14.44).

The smallest segment ('*taste-oriented*', $n = 143$) prefers product information related to taste. Consumers in this segment are younger than those in the '*health-orientated*' or '*eco-orientated*' segments (M = 38.83 years, SD = 13.53). Most (69 %) adhere to an omnivorous diet and, like '*health-orientated*' consumers, regularly eat meat (68 % at least three to four times a week). Interestingly, despite similar dietary habits,

[1] In study 2, x_{nj} describes the design matrix coding the attribute levels, whereas β'_n denotes a vector containing the part-worth utilities for each attribute level.

[2] Table A3 in the Appendix presents aggregated BWS scores.

[3] We would like to thank an anonymous reviewer for the suggestions for the segments' names.

Table 4
Socio-demographics by consumer segments from study 1.

Specification	Health-orientated	Eco-orientated	Taste-orientated	Test-statistic
N	288 (49 %)	156 (27 %)	143 (24 %)	
Gender				2.40
Male	139 (48 %)	73 (47 %)	66 (46 %)	
Female	146 (51 %)	83 (53 %)	76 (53 %)	
Non-binary	2 (1 %)	0 (0 %)	1 (1 %)	
Prefer not to say	1 (0.3 %)	0 (0 %)	0 (0 %)	
Age				4.00*
Mean (M)	42.40	43.31	38.83	
Standard Deviation (SD)	*15.29*	*14.44*	*13.53*	
Education				12.03
No Formal Qualifications	4 (1 %)	1 (1 %)	1 (1 %)	
1–4 GCSEs	14 (5 %)	10 (6 %)	6 (4 %)	
5–8 GCSEs	23 (8 %)	19 (12 %)	14 (10 %)	
Apprenticeship	9 (3 %)	4 (3 %)	1 (1 %)	
2 or more A-levels	53 (18 %)	15 (10 %)	24 (17 %)	
First or higher degree, professional qualifications	174 (60 %)	102 (65 %)	92 (64 %)	
Other vocational / work-related qualifications	10 (4 %)	4 (3 %)	4 (3 %)	
Other	1 (0.3 %)	1 (1 %)	1 (1 %)	
Diet [1]				61.69***
Vegetarian	18 (6 %)	25 (16 %)	11 (8 %)	
Vegan	1 (0.3 %)	16 (10 %)	1 (1 %)	
Omnivore	182 (63 %)	71 (46 %)	98 (69 %)	
Flexitarian	65 (23 %)	34 (22 %)	24 (17 %)	
Pescatarian	6 (2 %)	7 (5 %)	3 (2 %)	
None of the above	16 (6 %)	3 (2 %)	6 (4 %)	
Meat consumption [2]				12.44
Less than once per week	9 (3 %)	6 (4 %)	3 (2 %)	
Once or twice per week	52 (18 %)	33 (21 %)	22 (15 %)	
Three or four times per week	74 (26 %)	30 (19 %)	31 (22 %)	
Five or six times per week	79 (27 %)	26 (17 %)	49 (34 %)	
Everyday	33 (11 %)	10 (6 %)	17 (12 %)	
Missings	*41 (14 %)*	*51 (33 %)*	*21 (15 %)*	
Familiarity with PBM alternatives [3]				32.97***
Not familiar at all	16 (6 %)	2 (1 %)	4 (3 %)	
Slightly familiar	83 (29 %)	37 (24 %)	43 (30 %)	
Moderately familiar	98 (34 %)	38 (24 %)	46 (32 %)	
Very familiar	69 (24 %)	41 (26 %)	35 (24 %)	
Extremely familiar	22 (8 %)	38 (24 %)	15 (10 %)	
Consumption of PBM alternatives [3]				32.45***
Never	85 (30 %)	25 (16 %)	35 (24 %)	
Less than once per month	66 (23 %)	30 (19 %)	41 (29 %)	
Once or twice per month	59 (20 %)	27 (17 %)	31 (22 %)	
Once or twice per week	60 (21 %)	45 (29 %)	25 (17 %)	
Three times or more per week	18 (6 %)	29 (19 %)	11 (8 %)	

Note: [1] forced choice in study 2 | [2] only shown to omnivores and flexitarians | [3] PBM alternatives in general ***$p < .001$, **$p < .01$, *$p < .05$
We report the F-value for the age, while the others report the χ^2 statistic.

consumers in the '*health-orientated*' and ''*aste-orientated'* segments differ in their preferences, favoring nutrition and taste-related product information.

4.5. Discussion

The results of study 1 indicate a preliminary preference order for different FoP information. The strong preference for the *high in protein* information is consistent with previous research. Consumers recognize protein as a vital nutrient and link high-protein diets to health benefits (Neumann & Baum, 2016). Food marketing practice also commonly uses claims related to fat and fiber (Colby et al., 2010) and consumers perceive products with these attributes as more nutritious and effective in promoting health (Drewnowski et al., 2010). In line with previous studies, we found that information on the nutrient content was preferred over ecological-related information (Carlsson et al., 2022; Giezenaar et al., 2024).

Recognizing the heterogeneity in preferences is essential, as this influences market segmentation and targeting strategies. Vegans and vegetarians are more inclined than omnivores and flexitarians to favor product information concerning ecological issues (Noguerol et al., 2021; Verain & Dagevos, 2022), while these points of differentiation are less important for meat eaters (see Fig. 1). Giezenaar et al. (2024) arrive at a similar conclusion when examining the preferred product attributes of meat and PBM alternatives. While our findings align with the perspective that flexitarians prefer nutrition information rather than, for instance, taste-related details, we also find that the positive nutrition attributes of PBM alternatives (e.g., *low in saturated fat*) appeal to omnivores, particularly among older consumers. Flexitarians and older omnivores were more prevalent in the largest segment of health-orientated consumers. At the same time, the taste aspects are most important among younger meat eaters, who have a higher representation within the smallest segment (taste-orientated). This product information may help address the expectations of poor taste pleasantness associated with PBM alternatives (Vural et al., 2023).

Study 1 has its limitations. First, it employs the traditional BWS method, which does not assess the utility of the outside good (i.e., the utility of the no-buy option; see, e.g., Lagerkvist et al., 2012; Schramm & Lichters, 2024). Thus, it is uncertain whether product packages containing this information increase consumers' likelihood of purchase, particularly vis-à-vis meat. Furthermore, this study only inquired about the product attributes that consumers desire in textual form and did not display any graphical labels or actual product packages. Employing realistic visualizations in preference elicitation is shown to enhance

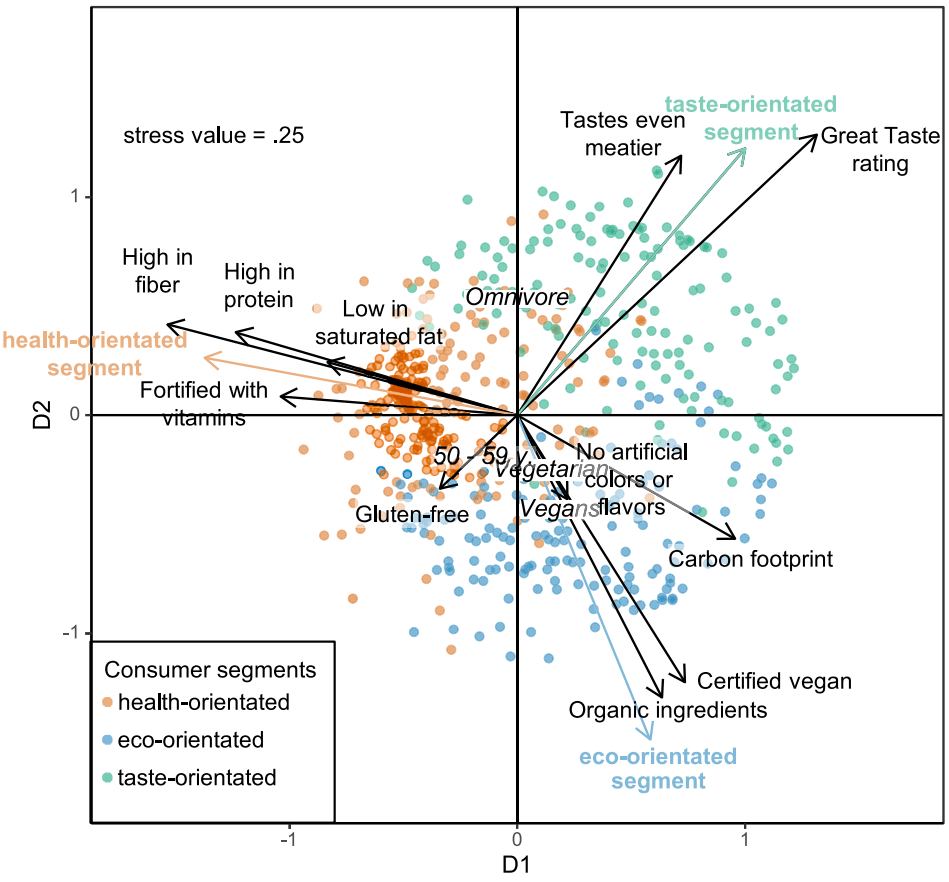

Fig. 1. Multidimensional scaling using study 1's items, preference segments, and other explanatory variables explained well by both dimensions. Colored dots represent the surveyed consumers of the 3 segments.

generalizability (Hauser et al., 2019).

Study 2, a DCE, addresses these limitations by presenting choice tasks that include labeled PBM products, meat products, and a no-buy option. To identify the most relevant attributes for study 2, we referred to study 1 and counted the number of times an item ranked among participants' top 3. The four most important pieces of product information according to this criterion were chosen, namely, *high in protein* (67.46 % of all participants), *low in saturated fat* (41.06 %), *high in fiber* (32.54 %), and *Great Taste* (28.79 %). *Great Taste* is the largest food and drink accreditation scheme in the UK (Guild of Fine Food, 2024) and its' preference over an uncertified taste claim (e.g., *Tastes even Meatier*) is consistent with Fenko et al.'s (2016) finding that consumers show greater skepticism toward a hedonic label from manufacturers compared to a third-party label.

Ecologically related product information was represented by the certified vegan label (the vegan-approved label from the Vegetarian Society of the United Kingdom) and a *carbon footprint* label. The former is the most frequently shown label on PBM patties (see supermarket audit), while the latter holds significant policy relevance in addressing the environmental impact of meat consumption (Gadema & Oglethorpe, 2011).

5. Study 2

5.1. Material and methods

Study 2 utilized an online DCE (i.e., a choice-based conjoint) to examine eight attributes (see Table 5 for the attributes and their corresponding levels). Before presenting consumers with the choice tasks, descriptions of the *vegan-approved*, *carbon footprint*, and *Great Taste* labels were provided (see Fig. A3 in the Appendix).

Table 5
Attributes and attribute levels of the DCE in study 2.

	Attribute	Level 1	Level 2	Level 3	Level 4	Level 5
1	Product type	meat	PBM			
2	High in protein claim	no	yes			
3	Low in saturated fat claim	no	yes			
4	High in fiber claim	no	yes			
5	Certified vegan label	no	yes			
6	Carbon footprint label	no	yes			
7	Great Taste label	no	yes			
8	Price	£2.50	£3.00	£3.50	£4.00	£4.50

To enhance realism, we show the actual graphical representations of the *certified vegan*, the *Great Taste*, and the *carbon footprint* label.

Study 2 employed an alternative-specific design, with the product type (meat or PBM) functioning as the alternative-specific constant (Orme & Chrzan, 2021, p. 35). As a result, the FoP labels and claims were displayed only for the PBM alternatives, while the meat option remained unlabeled, as is typically the case for meat products (e.g., Hieke et al., 2016). Therefore, we only varied the price for the meat product, which was otherwise shown with the same image as the PBM alternatives, as previously conducted by other researchers (see, e.g., van Loo et al., 2020). We varied the price and label/claim attributes for the PBM alternatives. Since the main objective of the analysis was to test FoP labeling for PBM products, the PBM level was replicated in the individualized choice designs to increase its occurrence (Orme & Chrzan, 2021, p. 30). Additionally, participants could opt not to choose any of the three alternatives. The DCE featured a minimal overlap design. Each

choice task displayed graphical representations of products based on the shown product characteristics, creating a realistic impression. Fig. 2 shows an exemplary choice task of study 2.

The software package Lighthouse Studio (Sawtooth Software Inc., 2024a) was used to implement study 2. Participants completed a series of 12 choice tasks, of which ten were used to calibrate utilities, and two were fixed holdout tasks for model validation (i.e., the same for all participants). Similar to study 1, participants answered questions about their diet, meat consumption, familiarity with and consumption of PBM alternatives, and also completed an attention check question.

The analysis utilizes the same hierarchical Bayes (HB) model as outlined in study 1. We implemented zero-centered effects coding (see Table A4 in the Appendix) along with a linear-coded and negatively constrained price function, which is commonly used (see, e.g., Sablotny-Wackershauser et al., 2024). The HB model predicts choices in the holdout tasks significantly better than the chance level (i.e., chance level of 25 %; hit rate for holdout task 1 of 80.23 %, hit rate for holdout task 2 of 80.91 %, both p-values $< .001$). We, therefore, conclude that the model possesses good predictive validity in out-of-calibration situations (Schramm, 2025) and we rerun our HB model by including all 12 tasks.[4]

5.2. Participants

The sample, recruited through Prolific, represents the UK population in terms of age and gender. We excluded participants who failed the attention check ($n = 10$), resulting in a net sample size of $N = 440$ (52 % female, 47 % male, and 1 % non-binary; $M_{age} = 46.04$, $SD_{age} = 15.78$; see Table 2). Almost two-thirds of the participants follow an omnivore diet, while 10 % adhere to a vegetarian or vegan diet.

5.3. Results

Table 6 displays the zero-centered attribute level utilities along with the attributes' relative importance. Price is the most important attribute, followed by product type (i.e., meat vs. PBM). Combined, these factors account for over 65 % of the participants' choices. The high standard deviation of the participants' zero-centered part-worth utilities suggests a significant preference heterogeneity for the product type. The most relevant FoP label is *Great Taste,* with an attribute importance of almost 10 %, followed by a *high in protein* claim (7.46 %). A *carbon footprint* label is the least important, which aligns with study 1's findings.

Next, we conducted market simulations to investigate the most appealing labeling strategy. We defined the following base market scenario: one meat and one PBM patty product without FoP labeling priced at £3.50, along with the no-buy option.[5] In the next step, we introduced an additional PBM alternative, each time featuring a different FoP label or claim (also priced at £3.50). For each labeled PBM alternative, this stepwise approach helps us understand where a label or claim draws the largest market share from, considering the initial options (i.e., meat product, unlabeled PBM product, none-option). To not fall prey to the independence of irrelevant alternatives problem (IIA; see, e.g., Hein et al., 2022), the HB model's posterior draws (800 per participant and attribute level) were used to estimate market shares. This step is essential because the product alternatives in the market simulation are quite similar. For each posterior draw, we implemented the first-choice rule, meaning that the participant's option with the highest total utility received 100 % choice likelihood, while the other options received 0 %. Finally, we compiled market shares from all posterior draws. The results (see Fig. 3) closely reflect those derived from the part-worth utilities. The PBM product with the *Great Taste* label gains the most market share (28.69 %) when entering the market. Most of its market share comes from the unlabeled PBM option (18.02 %), pointing to potential product cannibalization within the category. However, 6.32 % of the market share comes from the meat patty and 4.35 % from the no-buy option. The *Great Taste* label is projected to increase the PBM market by 10.67 %. Interestingly, the *low in saturated fat* claim is even more effective in drawing shares from unlabeled PBM patties (18.83 % market share), while the *high in protein* claim performs second best in drawing market share from the meat product (3.78 %).

As a key question of this research is how to make PBM alternatives more appealing to consumers, we conducted the same market simulations but categorized the data by the frequency of PBM burger patty consumption (last question in Table 2). In total, $n = 177$ participants reported never consuming them, while $n = 263$ do so regularly. Table 7 presents the results and shows the percentage increase in market shares of PBM alternatives for both groups in comparison to the base scenario. For both groups, the *Great Taste* label is the most important; however, for non-consumers, the difference between the *Great Taste* market share and other labels/claims is relatively more pronounced (i.e., the differences are less pronounced for regular consumers). Especially for non-consumers of PBM burgers, the *Great Taste* label significantly boosts market shares by 104.06 %.

We also simulated all 63 possible label and claim combinations to gain further insights. While a single label or claim may not be ideal for promoting PBM alternatives, displaying too many would clutter the packaging and make it visually complex (e.g., Bialkova et al., 2013; Orquin et al., 2020). The supermarket audit revealed that PBM patties typically display two to three labels/claims. Therefore, our analysis focuses on combinations of two or three labels/claims while maintaining a fixed price for all alternatives at £3.50.[6] The most promising three label/claim combination regarding market share is: *high in protein*, *low in saturated fat*, and *Great Taste* (43.44 %), which draws 13.71 % market share from the meat option. The most promising two label/claim combinations are *low in saturated fat* and *Great Taste* and *high in protein* and *Great Taste*, both with a market share close to 36 %. The latter combination draws a bit more market share from the meat option (11.10 % vs. 10.08 %).

Lastly, we estimated the WtP for the different labels/claims by calculating their reservation price, representing the participant's highest WtP before choosing not to purchase. Determining consumers' WtP is crucial for identifying the optimal price and is, therefore, highly relevant to manufacturers and retailers (Schmidt & Bijmolt, 2020). The reservation price is determined using the following formula (Miller et al., 2011, pp. 176–177):

$$WtP = \left(u_i^* - u_{it|\sim p}\right) * v_1^{-1},$$

where u_i^* represents the utility of the *none* parameter of individual i, $u_{it|\sim p}$ represents the total utility for a given product combination excluding the disutility of price, and v_1^{-1} is the inverse of the price utility of individual i. Table 8 shows the median and mean WtP, as well as the fraction of participants with a positive WtP. We also display the WtP only including the positive WtP (see Sablotny-Wackershauser et al., 2024). Participants have the highest WtP for the meat option ($M_{WtP} =$ £4.78), while the most promising PBM option is again one with the *Great Taste* label ($M_{WtP} =$ £3.95). This is, on average, £1.06 more than the WtP for the unlabeled PBM alternative.

[4] We also examined the interaction effects of the label co-occurrence. However, all tested interactions reduced the predictive validity (see also Sawtooth Software Inc., 2024b). Thus, we evaluated the main-effects-only model to prevent overfitting.

[5] Fig. A4 in the Appendix shows conditional market shares. Additionally, the Appendix displays unconditional demand curves (refer to Table A5 for the scenario and Fig. A5 for the results).

[6] Table A6 in the Appendix displays the results for all 63 combinations.

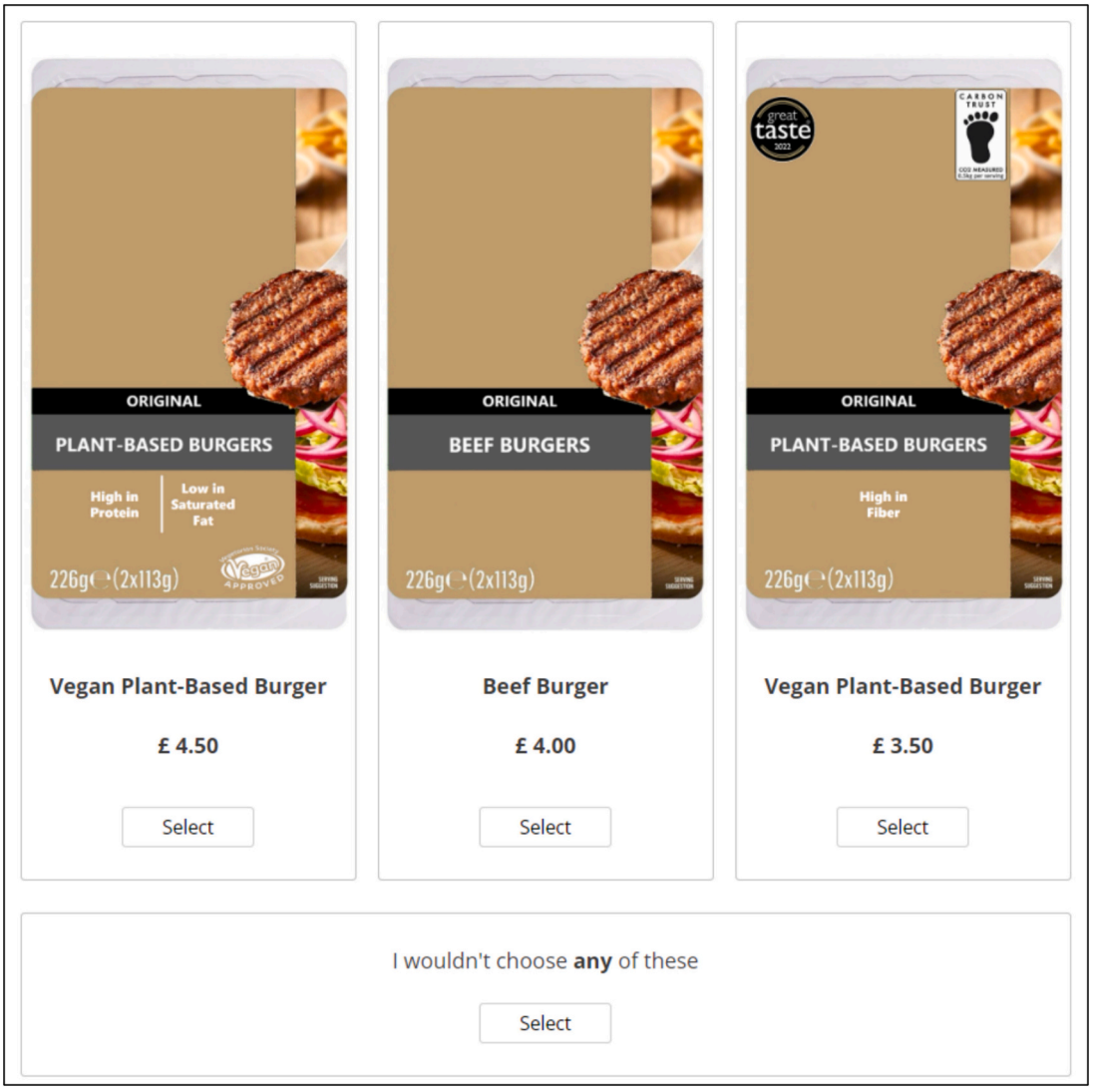

Fig. 2. Exemplary choice task of study 2.

Table 6
Zero-centered attribute level utilities and attribute importance (%) in study 2.

	Scores	Standard Deviations
Product type	**30.81 %**	**18.35 %**
PBM	−7.21	143.39
High in protein claim (N)	**7.46 %**	**5.30 %**
yes	27.45	24.20
Low in saturated fat claim (N)	**5.48 %**	**5.03 %**
yes	17.99	23.71
High in fiber claim (N)	**4.25 %**	**4.11 %**
yes	11.28	20.81
Certified vegan label (E)	**3.17 %**	**3.64 %**
yes	8.26	17.45
Carbon footprint label (E)	**3.40 %**	**4.33 %**
yes	7.63	20.67
Great Taste label (T)	**9.82 %**	**8.63 %**
yes	35.31	38.57
Price	**35.60 %**	**17.17 %**
increasing price	−142.42	68.69
None (utility of the outside good)	−31.55	215.47

Note: Attribute importance is displayed in bold, while attribute level utilities are shown in regular font | E = rather related to ecological issues | N = rather nutrition related | T = rather taste related.

5.4. Discussion

The findings that product type and price are more significant determinants of product preference than FoP labels and claims align with previous studies (Apostolidis & McLeay, 2016, 2019; Edenbrandt & Lagerkvist, 2021). Both meat eaters and non-meat eaters believe that PBM alternatives should be less expensive than conventional meat products (Cunha et al., 2018; Michel et al., 2021). Nevertheless, the utility of FoP labels/claims in increasing the appeal of PBM alternatives became apparent. This adds to the growing evidence regarding the influence of information provision on consumer willingness to experiment with PBM (Carlsson et al., 2022; van Loo et al., 2020).

Unlike study 1, the accredited taste label was the most significant and had the highest WtP among the PBM options. It, therefore, has the greatest potential to capture market share from meat patties. As *Great Taste* is the largest food and beverage awards scheme in the UK, its popularity may have increased its utility in study 2. This novel finding offers a promising opportunity for marketing PBM patties, as taste expectations are one of the primary barriers to consumer acceptance (Bryant & Sanctorum, 2021; Weinrich, 2019).

The polarized discourse and precarious beliefs about the nutritional benefits of PBM alternatives (see Ketelings et al., 2023; Lacy-Nichols et al., 2021) may explain why consumers place relatively high

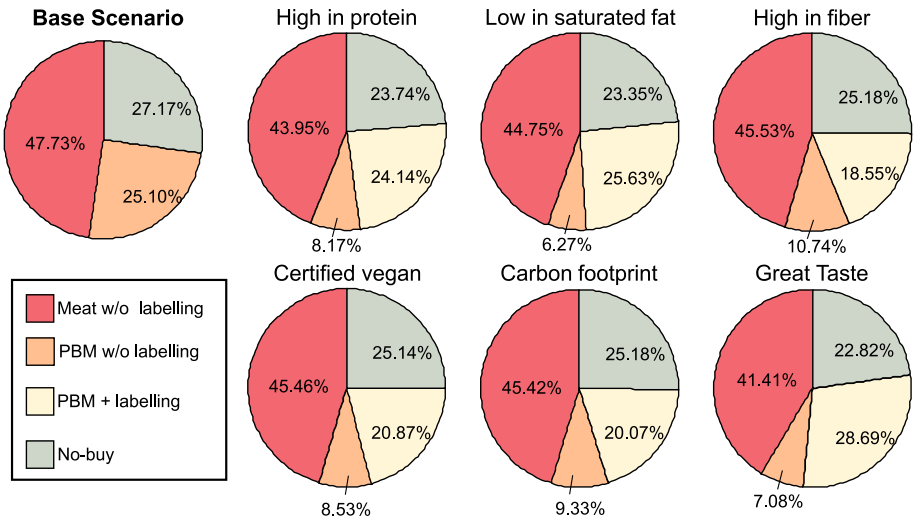

Fig. 3. Estimated market share for the baseline scenario and the impact of one PBM option along with a label or claim entering the market.

importance on nutrition information. The *high in protein* claim, which was most important in study 1, was the second most crucial in study 2. This is likely due to the inclusion of a meat option. Generally, omnivores believe meat has a higher protein content than PBM alternatives, while flexitarians perceive no difference. Only non-meat eaters view PBM protein as superior (Michel et al., 2021). Regarding the relative market share of the nutrition claims, a PBM patty with a *high in protein* claim performed best against a conventional meat patty. In contrast, a PBM patty with a *low in saturated fat* claim performed best against the unlabeled PBM option. As previously discussed, low saturated fat content is a perceived benefit of PBM alternatives, which appeals to some consumers, especially those driven by health concerns (Apostolidis & McLeay, 2019; Michel et al., 2021).

Consistent with study 1, we found that nutrition claims are more important than those primarily focusing on ecological issues. This aligns with research indicating that information regarding the environment and animal welfare has a relatively minor impact on the preference for PBM alternatives compared to information about their health benefits (Carlsson et al., 2022; Segovia et al., 2023; van Loo et al., 2020). In general, consumers believe that PBM alternatives are more environmentally friendly than meat products (Hoek et al., 2011; Oliveira Padilha et al., 2022; Segovia et al., 2023), which may explain why they do not place the same importance on ecological validation cues regardless of their dietary preferences. This appears to be the case with *carbon footprint* labels, as studies show that consumers' WtP for these labels is higher for food products perceived to be more harmful to the environment (see, e.g., Rondoni & Grasso, 2021). Similarly, concerning the *certified vegan* label, Stremmel et al. (2022) found that consumers consider such labels to be of minor importance when a product is assumed to be vegan by default.

6. General discussion

The present study aimed to identify the most impactful FoP labeling strategy used on PBM alternatives in the UK. This should help promote the adoption of PBM alternatives for more sustainable food consumption patterns. Specifically, it helps to identify which labels and claims are most influential in attracting new consumers to the product category. However, it remains to be demonstrated that labeling might outweigh previous (dissatisfactory) product experiences. The findings have implications for retailers and manufacturers of PBM alternatives in addressing the stagnant demand for PBM alternatives, as well as organizations marketing accredited labels, like *Great Taste*, in negotiating license prices with manufacturing companies.

Our three-fold research approach included an online supermarket audit, an online BWS to assess consumer preferences regarding product information, and an online DCE to examine market shares and WtP. The supermarket audit revealed various FoP labels and claims used by PBM alternatives. The BWS findings indicate that nutrition information is favored over ecological and taste information, with *high in protein*, *low in saturated fat*, and *high in fiber* being the most important information consumers seek. However, the three identified consumer segments have diametrically different preferences. The largest segment, '*health-orientated*', prefers nutrition information; the second-largest segment, '*eco-orientated*', prefers information on ecological issues; and the third segment, '*taste-orientated*', prefers information on taste. In addition, vegans and vegetarians tend to favor product information regarding ecological issues, while omnivores and flexitarians are more inclined toward nutritional information. Information on taste particularly appeals to omnivores. In a choice scenario simulated in study 2, product type (meat vs. PBM) and price are the key determinants of product preference, but FoP labels/claims do improve preferences for PBM alternatives. The results of the DCE show that a third-party certified taste label is the most effective way to capture market share from the option of not purchasing at all and meat products. It can achieve an average WtP of £1.06 more than the WtP for unlabeled PBM products. Nevertheless, the average WtP of this most promising product (M_{WtP} = £3.95) undershoots that of traditional meat patties (M_{WtP} = £4.78), creating a challenge for manufacturers and retailers alike. The market simulations indicate that combining a third-party certified taste label with a *high in protein* and/or a *low in saturated fat* claim is the most promising strategy for gaining market share.

This research adds to the limited empirical evidence in the social science literature regarding the decision-making processes involved in evaluations of PBM alternatives. No study has previously investigated the effects of taste-related labels/claims. In addition, environmental labels have been examined separately (Edenbrandt & Lagerkvist, 2021) or in combination with composite healthiness claims rather than specific nutrition claims (Apostolidis & McLeay, 2016, 2019; Carlsson et al., 2022; Giezenaar et al., 2024). More broadly, this study enhances understanding of the cue utilization theory concerning food product preferences. By examining various extrinsic cues, we discover that a third-party accredited taste label holds more significance for consumers than nutrition claims or ecological welfare labels. This preference likely stems from the perceived credibility of an accredited label, which necessitates considerable investment to acquire and is not easily modified (see also Fenko et al., 2016). Furthermore, a taste label is generally clear and easy to comprehend. In contrast, the *carbon footprint* label is less

Table 7
Unconditional market shares for participants regularly consuming (n = 263) and those never consuming PBM burgers (n = 177).

Scenario	Non-consumers (*N* = 177)	Consumers (*N* = 263)	PBM market share increase non-consumers	PBM market share increase regular consumers
Meat	**67.19 %**	**34.63 %**		
PBM w/o label/ claim	**6.90 %**	**37.35 %**		
No-buy	**25.91 %**	**28.02 %**		
Meat	64.85 %	29.88 %		
PBM w/o label/ claim	2.56 %	11.95 %		
PBM + high in protein claim	7.88 %	35.09 %	51.30 %	25.94 %
No-buy	24.71 %	23.09 %		
Meat	65.62 %	30.77 %		
PBM w/o label/ claim	2.01 %	9.13 %		
PBM + low in saturated fat claim	7.54 %	37.80 %	38.41 %	25.65 %
No-buy	24.93 %	22.29 %		
Meat	65.75 %	31.92 %		
PBM w/o label/ claim	3.07 %	15.90 %		
PBM + high in fiber claim	5.80 %	27.13 %	28.55 %	15.21 %
No-buy	25.38 %	25.05 %		
Meat	65.77 %	31.79 %		
PBM w/o label/ claim	2.55 %	12.56 %		
PBM + certified vegan label	6.33 %	30.65 %	28.70 %	15.69 %
No-buy	25.35 %	24.99 %		
Meat	65.91 %	31.63 %		
PBM w/o label/ claim	2.47 %	13.95 %		
PBM + carbon footprint label	6.34 %	29.30 %	27.68 %	15.80 %
No-buy	25.28 %	25.11 %		
Meat	62.35 %	27.31 %		
PBM w/o label/ claim	1.62 %	10.75 %		
PBM + Great Taste label	12.46 %	39.62 %	104.06 %	34.86 %
No-buy	23.57 %	22.32 %		

Note: Base scenario (i.e., no labels/claims) in bold | reference for the percentage increase is the base scenario.

diagnostic because it lacks comprehensibility, and its utility, along with that of vegan labels, is more dependent on consumer values and purchasing motives.

The consumer hype that initially surrounded the PBM market, along with the subsequent decline in demand, suggests that there are lapsed consumers who could be persuaded to try these products again if the taste and texture profiles improve (Bryant Research, 2023). This points to the importance of taste as a sensory intrinsic property of products. However, it must be acknowledged that a *Great Taste* FoP label would

Table 8
Mean and median reservation price (WtP) and fraction with a positive reservation price.

	Median (WtP > 0)	Mean (WtP > 0)	Fraction >0
Meat	£3.79 (£3.80)	£4.78 (£4.90)	98.41 %
PBM w/o label/claim	£3.07 (£3.35)	£2.89 (£3.73)	91.36 %
PBM + high in protein claim	£3.51 (£3.69)	£3.70 (£4.36)	93.41 %
PBM + low in saturated fat claim	£3.39 (£3.74)	£3.40 (£4.16)	92.27 %
PBM + high in fiber claim	£3.30 (£3.55)	£3.40 (£4.15)	92.27 %
PBM + certified vegan label	£3.20 (£3.39)	£2.97 (£3.82)	91.36 %
PBM + carbon footprint label	£3.25 (£3.46)	£3.20 (£4.05)	91.82 %
PBM + Great Taste label	£3.59 (£3.72)	£3.95 (£4.56)	94.09 %

likely improve the propensity of first-buyer activities. If the product experience does not meet the expectations the label sets, products may struggle to succeed in the long term because of low repurchase rates. Therefore, regarding PBM alternatives, there is a need for systematic sensory product optimization to foster market success and sustainable change (Lichters et al., 2021). Michel et al. (2021) highlighted that consumers look for meat alternatives that mirror meat in taste and texture. Our results indicate the highest relative potential for accredited taste labels and claims to enhance adoption among current non-users of PBM alternatives (see Table 7).

Health messaging is more effective than environmental messaging in encouraging meat eaters to try PBM alternatives (Segovia et al., 2023). However, the somewhat haphazard approach to nutrition labeling within the market, with some brands using an array of labels/claims and others using none, may potentially be off-putting and confusing for consumers. Our study indicates that an effective strategy for enhancing product appeal is to focus on labels and claims that emphasize the benefits of PBM alternatives. Similarly, research in Australia reveals that many brands do not seize the opportunity to promote the positive nutritional aspects of PBM alternatives, even though they meet the necessary legislative requirements for claims such as *high in protein* and *low in saturated fat* (Curtain & Grafenauer, 2019). Specifically, a *low in saturated fat* claim is a clearly distinguishable attribute of PBM alternatives that appeals to the growing flexitarian segment, who tend to be health-conscious. Promoting this quality can help challenge the negative health perceptions associated with PBM alternatives because many products are highly processed (Lacy-Nichols et al., 2021). This is also in line with the recommendations by Bryant Research (2023), which suggest that to persuade consumers to adopt these products as part of their diets, it is necessary to "*win the health argument*" and "*highlight the many health benefits of choosing meat alternatives over conventional meat*" (p. 2). In this regard, brands should adopt FoP labeling schemes that consumers recognize and understand well. One example is the Traffic Light Nutrition label (refer to Annex 5 by Department of Health and Social Care, 2016), which uses red, amber, and green to signify high, medium, or low levels of (saturated) fat, sugar, and salt. 90 % of consumers in the UK say it helps them make informed shopping decisions (Department of Health and Social Care et al., 2020). Therefore, this is a credible method to promote PBM alternatives' low saturated fat positioning. It also places responsibility on manufacturers to formulate their products with a focus on health and to adhere to policy efforts that encourage healthy food choices (van Kleef & Dagevos, 2015). Indeed, Public Health England has included meat alternatives in its salt reduction targets for 2023 (Public Health England, 2020).

In our study, a *carbon footprint* label had a relatively weak influence

on consumer choices. This suggests that more consideration is required for framing environmental arguments to promote PBM alternatives. Although many consumers care about the environment, they frequently ignore climate-impact labels when buying food (Grunert et al., 2014; Valck et al., 2023). Consumers struggle to understand the environmental impact of food products because of inadequate knowledge about carbon footprint labels and the limited use of these labels by food manufacturers (see Rondoni & Grasso, 2021). A consumer-friendly approach to label formatting and application, akin to the traffic light nutrition labeling scheme used in the UK, would enhance comprehensibility and enable consumers to quickly compare the environmental impact of PBM with conventional meat products (Panzone et al., 2020). Research shows that a traffic-light climate impact label effectively nudges meat eaters toward PBM alternatives, as long as they understand the label's meaning and their attention is directed to it (Edenbrandt & Lagerkvist, 2021; Hughes et al., 2024).

Ultimately, we must consider the cost of PBM alternatives, as it is the primary factor influencing choice, regardless of interest in meat-free products (Hoek et al., 2011; Michel et al., 2021). Besides taste, former consumers cite price as a major reason for cutting back on their consumption of PBM alternatives (Bryant Research, 2023), which is also highlighted in our market simulations. The average price of PBM alternatives is still higher than meat products (Good Food Institute, 2021), but there is evidence of more low-cost generic brand products entering the market (Siegfried, 2023). In Germany, the fast-food chain Burger King offers PBM burgers at a lower price than beef burgers (Burger King, 2024). When companies manage to increase production, cost reduction will allow for lower prices.

7. Limitations and future research

The current research is not without limitations. First, we examined the UK market, which has well-developed food labeling schemes and regulations. As a result, the study findings are more relevant for markets with similar characteristics (e.g., the EU). Second, while this study sample is representative of the UK population, the proportion of flexitarians, vegetarians, and vegans is relatively low, so future studies may want to focus on these groups. Third, in this study, participants only made hypothetical choices; they neither tasted any products nor had to live with their decisions. This tends to inflate their willingness to try new things (Ding et al., 2005) and their WtP estimates (Schmidt & Bijmolt, 2020; Schramm, 2025). Future research should consider incentive-aligned designs whenever possible. Additionally, this study does not investigate whether an accredited taste label encourages consumers who have had negative experiences with PBM alternatives to give those alternatives a "second chance". This is because study 2 did not collect data on unsatisfactory experiences within the product category. Therefore, in our analysis of current consumers versus non-consumers (Table 7), we cannot distinguish between individuals who have never had experience with the category and those who have turned their backs on it due to unsatisfactory consumption episodes. Fifth, we consistently presented two PBM options and one meat alternative in the choice tasks of study 2. This approach could have highlighted the selection of PBM over meat products. We needed this design element to gather sufficient observations for each label and claim, as they would be otherwise underrepresented in tasks with only one PBM alternative. Future research may utilize other conjoint designs. Sixth, unlike prior research conducted in the field, our study did not include the brand name as an attribute (see, e.g., van Loo et al., 2020). Future research could explore whether certain labels or claims perform better for branded versus unbranded PBM products. Finally, some manufacturers of PBM alternatives might not have the chance to apply every FoP label investigated in our study. For example, one might consider situations where the production process is unlikely to justify a product's claim of being *high in protein*. Given this context, the question remains whether modifying product recipes to use certain labels or claims is worthwhile.

8. Conclusion

Alternative protein sources are crucial for reducing meat consumption, but substantial barriers to public acceptance must be tackled (Committee on Climate Change, 2019). Recently, crucial markets in the US and UK have seen a significant drop in sales, which analysts link to an excess of poorly designed products (Duncan, 2023; Plant Based Foods Association, 2024; Terazono & Evans, 2022). Brands and retailers need to improve their target marketing by better understanding customer preferences. Our research indicates that although product type and price are the main factors influencing consumer choice, appropriate FoP labeling that emphasizes product benefits can shift preferences toward PBM alternatives. Emphasizing the taste and nutritional benefits, especially the protein content and low saturated fat, is the most effective strategy to enhance the appeal of PBM alternatives.

CRediT authorship contribution statement

Paul Naughton: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Joshua Benjamin Schramm:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Marcel Lichters:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Resources, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization.

Ethical statement

Informed consent was obtained from participants for both main studies reported in the manuscript. The Ethics Committee of Edinburgh Napier University approved the methodological procedure (project ID 2939976).

Funding

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Author 2 received an academic Ph.D. grant from Sawtooth Software, Inc. (USA).

Declaration of competing interest

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.

Appendix. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2025.105567.

Data availability

The data (and analysis scripts in R) is freely available from the open science framework (https://osf.io/ku9mq/).

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