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Exploring Consumer Sentiments and Beliefs About Meat Alternatives

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1. Introduction

Understanding consumers' sentiments and beliefs about novel and emerging foods, such as meat alternatives, is essential for promoting a shift towards healthier and more sustainable diets. Consumers' beliefs about these products encompass a range of themes, including health, sustainability, and taste, making the analysis and classification of these beliefs challenging. Traditionally, research on consumer attitudes towards novel food and food technologies, including meat alternatives, has used closed-form questions in surveys. However, this method can constrain respondents' answers and potentially bias their responses, limiting the range of possible responses (Schwarz, 1999), and failing in capturing the nuances of consumer opinions.

In contrast, open-ended questions allow for more unrestrained responses, enabling the emergence of topics that may be difficult to quantify but unrestrained and more detailed. However, analyzing these responses requires sophisticated tools that can perform quantitative categorization of qualitative data. Advances in machine learning and Natural Language Processing (NLP) provide a solution, allowing researchers to identify latent topics and categorize opinion and emotions from unstructured textual data (Ash et al., 2023).

The urgency of refining understanding of consumer opinion and beliefs is underscored by environment, animal-welfare and health concerns associated with meat consumption. Despite a growing body of research indicating increasing consumer interest in meat alternatives and concerns about meat consumption (e.g. Graça et al., 2019; Van Loo et al., 2020), the rise in meat consumption remains an issue. This trend persists and underscore concerns related to public health, environmental damage, and animal welfare associated with large-scale livestock farming (Rubio et al., 2020). The U.S., for example, remains one of the largest beef consumers globally, with an average consumption of 58.1 lb per capita in 2023 (USDA ERS, 2024).

However, the market offers a variety of emerging meat alternatives. Brands like Impossible Foods and Beyond Meat have popularized plant-based options, and companies such as Quorn have introduced mycoproteins derived from fungi. Furthermore, startups like Planetarians are innovating with upcycled meat alternatives, which utilize by-products from the food supply chain to address environmental concerns and meet the demand for sustainable solutions (Lu et al., 2024). Besides some studies have analyzed consumers' preferences and attitude for protein alternatives such as plant-based meat alternatives (e.g. Caputo et al., 2022; Van Loo et al., 2020) or mycoprotein (e.g. Dean et al., 2022) they haven't explored consumer sentiment and beliefs about

these innovative products using open-ended questions to capture a broader spectrum of consumer opinions. This gap in research highlights the need for studies that can capture more nuanced consumer perspectives on these emerging food and related technologies.

2. Methodology

Consumers' sentiments and beliefs about plant-based meat alternatives, have been collected in an online survey distributed to 2,100 respondents in the U.S. The experiment utilizes a between-subjects design with two treatments and one control group. In the control group, respondents were simply asked to state their opinions and beliefs about meat alternatives, reporting their thoughts in the order they came to mind and being as detailed as possible (Graeber et al., 2024). In the treatment groups, respondents were asked to report their opinions and beliefs about the content of a video they watched detailing the production methods and environmental impacts of protein alternatives like plant-based meat, mycoprotein, bean-based burgers, and upcycled plant-based meat. The first treatment group received the video information in a logical-scientific style, characterized by a formal tone and precise details, while the second group was presented with information in a narrative-storytelling style, using a more casual and less detailed tone. Indeed, the literature demonstrates that conveying information in a narrative style can have a stronger impact on consumer behavior (Yang & Hobbs, 2020).

Data analysis employs a multi-step approach (Ash et al., 2023). We follow the standard text analysis and preprocess text data such as removing stop words, stemming, etc. as the initial step to ensure irrelevant information is removed and the core linguistic information is kept for analysis. We then conduct sentiment analysis to identify the sentiments into positive, negative, or neutral within each response to show the attitude towards meat alternatives. To extract key topics that emerge naturally from the participants, Latent Dirichlet Allocation (LDA) is used to build the topic model. By comparing sentiment distribution and topic prevalence and across the treatment groups, we aim to identify potential drivers of attitudes toward meat alternatives and explore effective messaging strategies.

3. Contribution

By analyzing open-ended responses, we can enrich the academic discussion and understanding of consumers' beliefs and sentiments surrounding meat alternatives. Our preliminary results suggest that participants generally express more positive than negative sentiments. Positivity tends to

increase when participants are exposed to a narrative-style video, while the scientific-style video also elicits positive reactions, though to a slightly lesser extent. In contrast, responses in the control group are more mixed, with a greater presence of neutral or uncertain attitudes.

In terms of content, topic modeling results show that consumers consistently engage with themes related to health, sustainability, and taste.

By understanding the language and concerns of consumers, producers can design products that better meet consumer needs and craft messages and narratives that resonate more effectively with their target audiences. Insights into consumers' opinions and sentiments can guide regulatory frameworks and inform policymakers about the implementation of policies that promote sustainable dietary choices.

4. Selected Literature

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