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From personal benefits to green motives: consumer segments for targeted sustainability transitions in workplace canteens

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This study came to life through a collaboration between researchers and the service and food industries, aiming for nuanced consumer insights that may inform future sustainability interventions in workplace canteens. The study applied a mixed-methods approach to evaluate consumers' attitudes, motives, and preferences within the canteen setting and with respect to the sustainability of food choices. Analyses of the quantitative data identified three distinct consumer segments that demonstrate the variability of consumers in food preferences and sustainability orientations. One segment was motivated by personal benefits, a second by both benefits and consideration for animal welfare, and a third was more markedly oriented toward sustainability. The qualitative analyses contributed additional viewpoints on feasible and desirable changes to canteen menus and operations. Combined, the findings highlight the necessity for canteens to consider the diversity of their clients and adopt versatile strategies tailored to distinct motives and preferences. This can in turn transform the canteen into an arena for testing sustainability interventions, yielding further insight into the efficacy of a range of means. The ambition is to extend outcomes of canteen interventions to other arenas, commencing with the household and culminating with society at large.

KEYWORDS

sustainability, plant-based, consumer segments, food choice motives, canteen interventions

1 Introduction

Despite decades of warnings, it seems that many have only recently come to realize that the world cannot sustain our current level of consumption. Among other consumer habits, research has highlighted the importance of changing the way we eat (de Boer and Aiking, 2019). Combined, the world's food systems contribute to one third of humankind's global greenhouse gas emissions; in addition, agricultural production is responsible for the majority of humanity's freshwater use and occupation of habitable land (Crippa et al., 2021). Of course, food consumption patterns vary globally, and the consumption of animal-based proteins is particularly skewed, in favor of the European and American nations (Henchion et al., 2021) and those with high incomes (de Boer and Aiking, 2019). Relatedly, the production of red meat is a prominent source of emissions and land and water use (Crippa et al., 2021). Still, red meat constitutes one of the food products we could feasibly reduce or even replace with more sustainably produced proteins (de Boer and Aiking, 2019; Willett et al., 2019), and vegetarian replacements can reduce greenhouse gas emissions by approximately 30% (Boyano Larriba et al., 2019). Switching to more plant-based diets is only one of several known and accessible

ways to lessen the impact of our food systems, we just need to make the choice and guide others down the same path.

The realization that we need to change the way we eat is neither comfortable nor easy to act on, as it impedes our way of life. However, change need not be forced, it can come from gradual exposure or instant inspiration, and the food service industry can provide the stage for this change. Aiming to uncover what is needed on such a stage, we set out to examine food choice motives that may characterize different segments of canteen customers, investigate their respective attitudes and behaviors in connection to food and sustainability, and finally, address consumer perspectives on plant-based dishes and how the workplace canteen might improve operations to potentially influence food habits at home.

1.1 Theoretical background

1.1.1 Who will go green?

Making a food-related decision can be a complex process, where policies, economy, contexts, environmental cues, social norms, personal preferences, knowledge, and internal states weigh in (Lorenz and Langen (2018)). Individual factors are often assessed through personal values or motives, which cover a variety of categories such as taste and appearance, price and convenience, mood and familiarity, health and naturalness (Onwezen et al., 2019), as well as sustainability considerations concerning the climate and environment, seasonal and local produce, social justice, and animal welfare (Onwezen et al., 2019; Verain et al., 2021). Nevertheless, the food choices we make are often driven by spontaneous and sometimes unconscious reminders (Papies et al., 2020). There also seems to be a general tendency to overestimate how much weight is placed on different motives in the moment of choosing, among them hunger, price, habits, social and traditional aspects, along with natural concerns (Wahl et al., 2020). The latter category includes concerns about the naturalness and safety of food products, fair trade, and environmental impact (Renner et al., 2012), none of which appear to have much bearing on in-the-moment food choices (Wahl et al., 2020). The implication is that sustainability-oriented food choices are left to the most vigilant consumers, whereas the majority are presumably more likely to let other motives and situational factors dominate their decisions. This acknowledgement comes with an upside, related to the potential susceptibility of less aware consumers to external cues and choice contexts.

Not everyone is likely to be swayed toward more sustainable choices; studies and reports have demonstrated significant individual differences between those who are willing to modify their diets and those who are not. For instance, health considerations and animal compassion can both be internal drivers for reducing or avoiding meat products (Milford and Kildal, 2019; Pohlmann, 2021). Moreover, dietary choices vary across age, gender, and other demographics. A Norwegian public health report showed a larger share of young, female, urban, and university-educated respondents among those who had altered their diets for reasons related to the climate and sustainability (Abel and Totland, 2021). Similar results have been reported for Danish and Dutch samples (Hielkema et al., 2022), while a German study found young age, social and flexible lunchtime habits, and environmental attitudes to predict sustainable food choices (Lorenz-Walther and Langen, 2020).

The reduction of animal proteins and transition to plant-based alternatives is of particular interest in the sustainability, dietary

shift (Willett et al., 2019), again with studies demonstrating differences in acceptance and adoption across demographical groups. In short, men (Gonera et al., 2021; Hielkema and Lund, 2021; Lacroix and Gifford, 2020; Modlinska et al., 2020), older generations (Gonera et al., 2021; Hielkema and Lund, 2021), and rural inhabitants (Gonera et al., 2021; Hielkema and Lund, 2021) are over-represented in groups that are reluctant to change their meat consumption. Less knowledge about and interest for food sustainability among blue-collar workers makes this also a consumer group harder to reach and change (Bayram and Kiziltan, 2024). That is not to say that all efforts should aim for those demographics. Instead, more detailed insight about different consumer groups can facilitate the design of interventions that target other prominent motives, alongside sustainability, for instance the willingness to try out new food, to socialize over a meal, or to feel compassion with an animal.

1.1.2 How do canteens go green?

The food sectors are also showing interest in plant-based alternatives to animal-based proteins (Bianchi et al., 2018; European Vegetarian Union, 2023; Lombardini and Lankoski, 2013); across Europe, public canteens and schools are embracing plant-based options with green public procurement as a tool to boost the green shift (Boyano Larriba et al., 2019). A number of cities and towns have already adopted national or local strategies; to name a few, Portugal and France are mandating plant-based choices in public procurement, while Copenhagen is the first city with 100% organic public canteens (European Vegetarian Union, 2023). Against this backdrop, we foresee a so-called contextual spillover (Verfuert et al., 2021) where canteens' encouragement of sustainable food choices might generalize to other domains, starting with the household and over time broadening to more sustainable eating patterns on a societal level. This behavioral spillover from one arena to another has previously been reported by canteen guests who were exposed to a social marketing campaign that promoted the canteen's reduction of red meat (Verfuert et al., 2021). Similarly, when supplying university students with free fruit and vegetables on campus, a Belgian study found a contextual spillover with larger amounts of greens eaten for subsequent meals (Lachat et al., 2009). Another two studies have investigated how offering take-away meals in workplace canteens can bring about a spillover effect to healthy meal habits at home, but these did not consider other members of the household (Lassen et al., 2011; Poulsen and Jørgensen, 2010). In other words, the potential spillover from sustainable canteen lunches to sustainable family dinners is a topic that warrants attention from food service, food production, consumer, and innovation researchers alike.

The potential of canteens as platforms for dietary shifts has not gone unnoticed by researchers delving into the effects of sustainability-oriented interventions (Bianchi et al., 2018; Pandey et al., 2023; Sullivan et al., 2021; Velema et al., 2018), with studies demonstrating the promise inherent in situational factors such as nudging and choice settings, strategic menu design, availability of alternatives and information, and the presentation of options, including portion sizes and preparation (Lorenz-Walther and Langen, 2020; Pandey et al., 2023; Perez-Cueto, 2021; Taufik et al., 2022; Zhang et al., 2022). Several have also documented positive effects, such as heightened food literacy and pro-environmental values, as well as behavioral changes related to food consumption and food waste (Sullivan et al., 2021).

Two opposing approaches to boosting plant-based choices are either to restrict the offer of meat or to make the plant-based options more readily available (Lombardini and Lankoski, 2013; Ohlhausen and Langen, 2021; Zhang et al., 2022). Although the former may lead to non-compliance at first, there are indications that reactive behaviors decline over time, eventually leading to acceptance (Lombardini and Lankoski, 2013). However, reactance may be avoided by providing options instead (Lombardini and Lankoski, 2013), and canteen consumers are seemingly united when it comes to prioritizing spontaneous choices over pre-orders, as well as having a variety of alternatives (Ohlhausen and Langen, 2021). Others have highlighted the efficacy of different types of meat-reduction interventions. Among the approaches that have demonstrated a reduction in sales and consumption of meat products are the offer of dishes with meat alternatives, the downsizing of meat portions, the repositioning of food or menu items, and the manipulated appeal of a meat- or plant-based dish (Attwood et al., 2020; Bianchi et al., 2018; Langen et al., 2022; Taufik et al., 2022; Zhang et al., 2022). Repositioning is a common strategy to boost the sales of plant-based foods, typically by placing them at the most prominent spot in the canteen and first on the menu so that they become the easiest choice (Hielkema et al., 2022; Langen et al., 2022; Taufik et al., 2022; Zhang et al., 2022). Although some researchers have concluded that descriptive manipulations do little to reduce sales of meat-based dishes (Bianchi et al., 2018), others recommend the use of sensory, geographic, or nostalgic names to boost taste expectations (Ohlhausen and Langen, 2020). Indeed, something as simple as the description on a menu or a label can be sufficient to nudge consumers toward a more sustainable option, for instance by describing a dish as environmentally friendly (Krupan and Houtsma, 2020) or coming from sustainable agriculture (Ohlhausen and Langen, 2020).

1.2 Harnessing insight to guide consumers

Canteens can set the stage for studying natural consumption patterns during sustainability transitions; many of the external and internal factors that steer our food choices are free to mix and mingle in the everyday setting of a canteen, also providing an isolated

environment for these interactions. However, the majority of studies on canteen interventions and nudges are based on the researchers' input rather than on canteen guests and their attitudes, motives, values, and specific needs; the consumers involved only partake at the moment of choice and purchase. Lorenz-Walther and Langen (2020) argue for the importance of considering customer opinions at an early stage, prior to making changes to canteen operations; in their study, they demonstrate the viability of a weekly vegetarian day, but mostly among those already oriented toward sustainable consumption. This work covers the early stage of an innovation process toward more sustainable canteen food choice, seeking insight that may guide future implementations. The objective is to study canteen consumers' attitudes, behaviors and perspectives on food, sustainability and canteen meals, guided by three research questions:

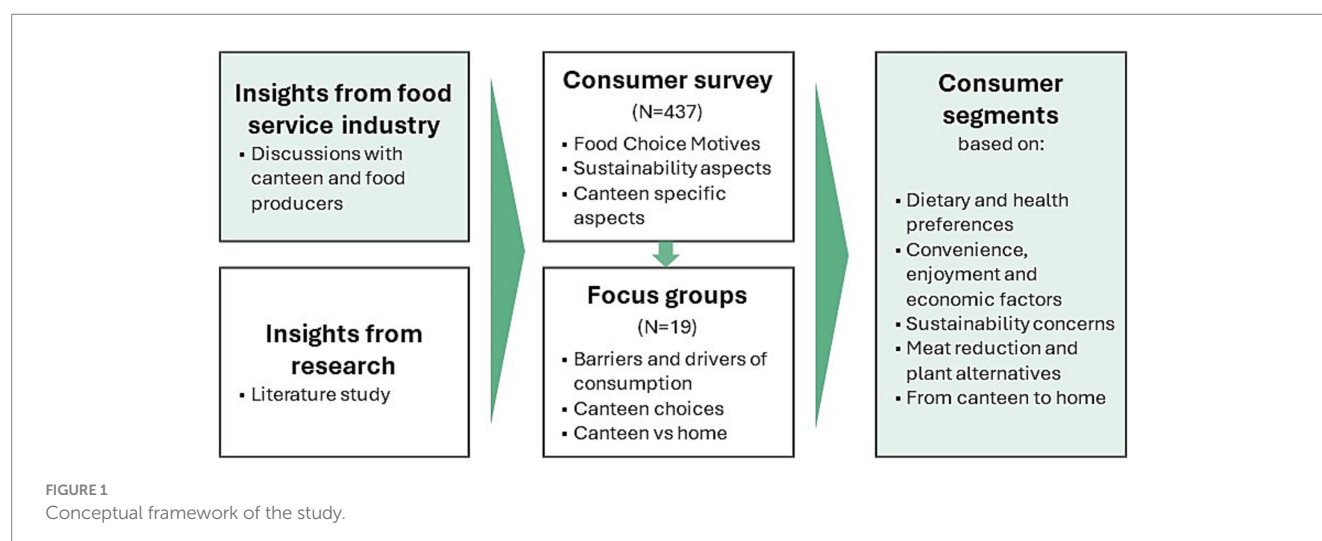
- 1 What are the distinguishing food choice motives of different consumer segments?
- 2 What do consumers prioritize in the canteen setting and how do they consider the food's sustainability?
- 3 How do consumer preferences align with more plant-based canteen offers?

2 Methods

We relied on a mixed methods approach to first survey food choice motives and sustainability priorities among larger samples of canteen regulars, followed by focus group interviews for in-depth understanding of different segments' perceptions of sustainability-oriented initiatives and their inputs on desired alternative offers in their workplace canteen. The conceptual framework is depicted in Figure 1.

2.1 Study 1. Survey

To scope the food-related motives and attitudes to sustainable products and practices among regular canteen consumers, we ran a



survey with workplace canteen guests frequenting one of 19 different canteens in Norway in November and December, 2022.

2.1.1 Participants

Recruitment was done through the internal communication platforms of two canteen management companies, with messages going out to employees of companies whose worksite canteen was operated by them. Participants were invited to partake in the study through one of three options: Volunteers could sign up for an online survey, a focus group interview, a food diary program, or all of the above. Initially, 491 signed up for the survey. After excluding those who visited the canteen less frequently than 1–2 times per week, as well as those who worked in directly relevant departments (e.g., product development or catering), with the final sample comprising 437 survey respondents (Table 1).

2.1.2 Measures

The survey consisted of four parts, with a total of 55 questions and statements. The first addressed the background information presented in Table 1, as well as food and shopping responsibilities in the home. The following three sections assessed food choice motives, subjective connotations to food and sustainability, and food behavior at-home and in the canteen; the details of these sections are provided in Table 2. The items adopted from Onwezen et al. (2019) and Verain et al. (2021)

were translated to Norwegian and back-translated to English for validation and adjustments.

2.1.3 Procedure and material

Everyone who signed up for the survey, received a subsequent e-mail with direct links to the online EyeQuestion form; respondents could choose to follow the link to either the Norwegian or English version. The survey commenced with general information about the study, along with a consent form, before proceeding to the questions and statements. All respondents were offered the choice to enter a lottery for the chance to win a food basket.

2.1.4 Data analyses

The survey data were first summarized with descriptive statistics (demographics). Principal component analysis (PCA) was performed on the average food choice motive scores (section 2, Table 2), followed by a hierarchical clustering analysis (HCA) on the PCA factors to study consumer segments across the measures related to sustainability and plant-based food (sections 3 and 4, Table 2). ANOVA was run with segment taken as an effect (statement ~ gender + age group + segment, $p < 0.05$), followed by group-wise comparisons between segments using Tukey's HSD. To investigate respondents' most important sustainability terms in the context of food, from their selection and ranking, we summated the number of selections for each term; these were similarly analyzed across segments with ANOVA and Tukey's HSD. Chi-square tests were performed to investigate effects of socio-demographics across segments.

TABLE 1 Demographical details for the 437 survey participants.

Demographic	Level	Number
Gender	Female	239
	Male	198
Age group	≤ 29 years	76
	30–39 years	118
	40–49 years	129
	50–69 years	114
# adults in household	1	132
	2	245
	3 or more	60
# kids in household	None	241
	1 or more	196
Educational level	High school, or below	72
	University degree, Bachelor or above	346
	Other/undisclosed	19
Individual income level	< 1.000.000 NOK (≈ €87.000)	300
	≥ 1.000.000 NOK (≈ €87.000)	112
	Undisclosed	25
Work type	Mainly office work	357
	Mainly hands-on work	28
	Combination	52
Length of current employment	< 1 year	53
	1–3 years	123
	4–10 years	143
	> 10 years	118

2.2 Study 2. Focus groups

The survey was followed by focus groups with the same population as in study 1. The purpose of the focus groups was to gain deeper qualitative insights on the survey findings, including prevailing attitudes, drivers, and barriers to choosing plant-based meals in canteens. Input from participants for possible desired changes around the offering of plant-based food was sought. The focus groups were carried out in March 2022.

2.2.1 Participants and canteens

An invitation form was sent to participating canteens in Norway, asking for voluntary participation in a digital or in-person group discussion. Initially there were 29 who agreed to participate in a focus group, yet 10 individuals were unable to attend. The final 19 participants were aged between 25 and 54 years and comprised nine females and 10 males; participants were regular frequenters of the seven canteens summarized in Table 3.

2.2.2 Procedure and material

We ran three focus groups with 6 to 8 participants of both genders; each session lasted approximately 90 min. Due to restrictions enforced by the COVID-19 pandemic at the time, participants were offered options for attendance so that two focus groups were conducted in-person and one was online (Menary et al., 2021). The online group (3 males, 3 females) was attended by employees from six companies, thus representing six different canteens. The two in-person groups (4 females, 3 males; 2 females, 4 males) represented two canteens. All

TABLE 2 Detailed questionnaire content.

Section content	Source of included items	Measure framing	Measure assessment
Section 2. Motives underlying food choices, evaluated as the importance of different food attributes	11 statements from the Single-Item Food Choice Questionnaire (Onwezen et al., 2019), plus six items specific to the local and national context	“It is important to me that the food I eat on a typical day is ...”	7-point Likert scale, ranging from 1 “not at all important” to 7 “very important”
Section 3. Sustainability meaning, by identifying subjective connotations to sustainability and food	11 terms related to food and sustainability, adapted from the Sustainable Food Choice Questionnaire (Verain et al., 2021) and refined through project discussions	“When you hear the word ‘sustainability’ in the context of food - what do you think about?”	Selection and ranking of the five subjectively most important terms
Section 4. Preferences for sustainable and plant-based food, evaluated as food behavior in the canteen and at home	23 items developed by the project members and pilot tested prior to the survey	“Think about the food you eat in the canteen and the food you eat at home:”	7-point Likert scale, ranging from 1 ‘completely disagree’ to 7 ‘completely agree’

canteens follow a proposed menu plan from the head office but have local adaptations.

The study applied a phenomenological research design, allowing for open questions to gain deeper insight into participants’ experiences and reflections on plant-based meals. The focus groups were conducted according to a predetermined interview guide to facilitate semi-structured data collection. Two researchers developed the interview guide, informed by the survey results and from related studies on canteen interventions, and two other researchers provided inputs and suggestions.

The focus groups started with “warm up” exercises, word associations with food photos and the terms “sustainability” and “plant-based,” before moving on to the actual interview. Discussions were facilitated and led by one of the authors, while two additional researchers took notes; the on-site sessions were audio recorded and the online session was video recorded in Teams. The facilitator made sure that all participants were active in the discussion and shared their thoughts. All participants received a gift voucher of 300 NOK (≈€25) as compensation for their time.

The interview guide was structured around the following three topics and research questions:

- What influences the choice of plant-based dishes in the canteen?
- How to promote and communicate plant-based food in the canteen?
- How can serving dishes in the canteen affect food choices and cooking at home?

2.2.3 Qualitative analysis

The focus group recordings and notes were transcribed and read independently by three researchers to assure internal validity. The following steps of analysis were performed by adopting the approaches from Braun and Clarke (2012) and Castleberry and Nolen (2018): (1) familiarization with the data and identification of initial themes according to the interview guide, (2) agreement on themes by three researchers, (3) writing descriptive summaries, making initial interpretations, and clustering the themes within and across focus groups, and (4) discussion among researchers and summary of results including selection of quotes to illustrate the findings. We relied on a phenomenological approach to thematic analysis, permitting both expected and unexpected patterns to emerge from the data (Castellini and Graffigna, 2022); as an exception, we structured the analysis of

results pertaining to the canteens’ promotions of plant-based food according to Attwood et al. (2020) behavioral change interventions. All analyses were carried out in the original language (Norwegian) and then translated to English; although the translations may have been modified to ensure readability, we have strived to preserve their original meaning.

3 Results

Our analyses uncovered distinct food choice motives, canteen preferences and sustainability considerations across three consumer segments.

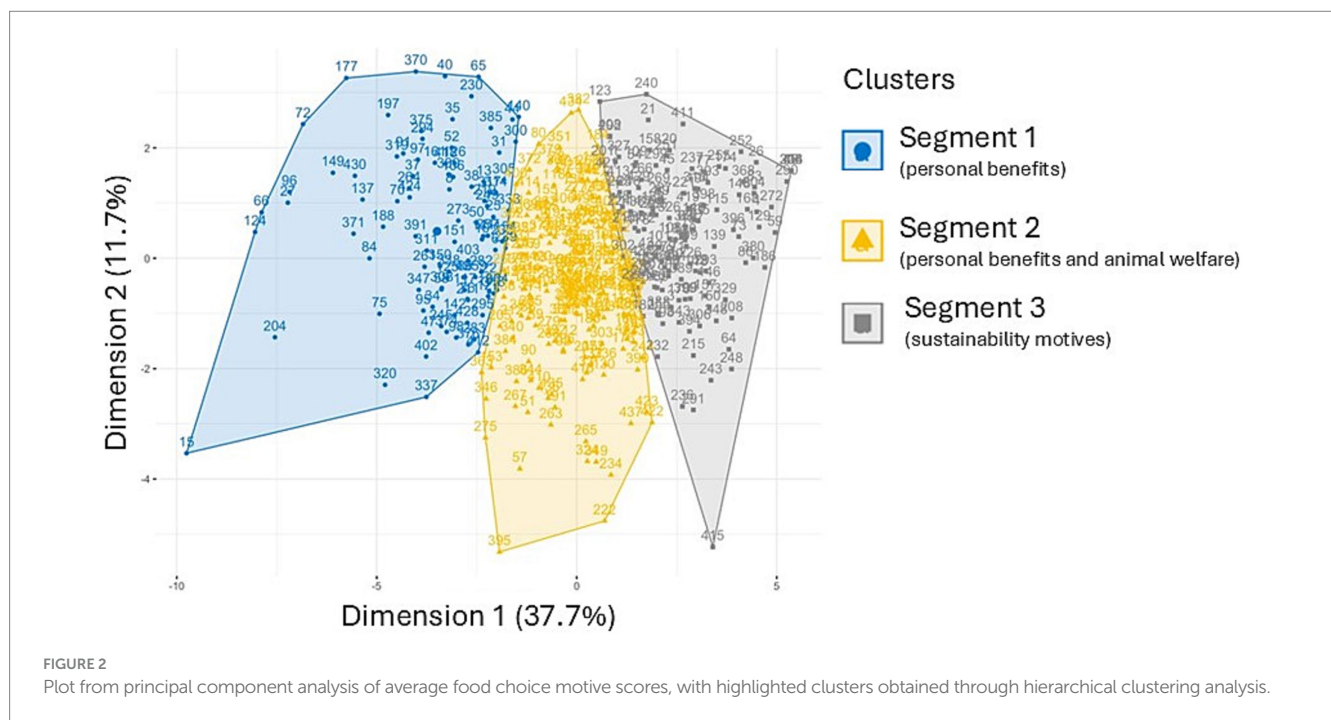
3.1 Distinguishing food choice motives of different consumer segments

The survey data on food choice motives were first visualized with a principal component analysis, displayed in Figure 2, and the three identified consumer segments were further refined through cluster analysis and HCA. The majority (201 respondents) seems to converge on the same motives in cluster 2, while there are fewer respondents in segment 1 (98) and segment 3 (138). When delving into their food choice motives, segments 1 and 3 appear distinct; where the former prioritize individually oriented motives, such as pleasurable sensation or weight control, the latter place importance on sustainability aspects. Segment 2 seems to balance these motives, along with more emphasis on animal welfare and convenience than the other two segments. Figure 3 provides a full summary of the most highly rated food choice motives for each segment.

Table 4 shows the segments’ demographics and differences in their compositions. Overall, age, income level, and household composition do not vary significantly across segments. Conversely, gender differs significantly between segments 1 and 3, with more males in the former and more females in the latter. Educational level is also significantly different, though between segments 1 and 2; segment 2 comprises more respondents with university degrees, nearly 90%, while there are more who finished their education after high school (or earlier) in segment 1. Going by these demographics, females appear more prone to consider sustainability motives and those with university degrees may be less likely to only consider personal benefits.

TABLE 3 Overview of canteens frequented by focus group participants.

	Canteen 1	Canteen 2	Canteen 3	Canteen 4	Canteen 5	Canteen 6	Canteen 7
Focus group	Physical	Physical & online	Online	Online	Online	Online	Online
Location	Stavanger	Oslo	Bergen	Greater Oslo	Greater Oslo	Greater Bergen	Stavanger
Price model	Buffet	Per piece/meal	Per piece/meal or weight	Per piece/meal or weight	Per piece/meal	Per piece/meal or weight	Per piece/meal or weight
Warm meal portioning	Self-service	Pre-portion	Pre-portion	Self-service	Pre-portion	Self-service	Pre-portion
Guests daily	400–500	300–350	250	260	250	200	650
Opening hours	10:30–13:00	10:45–12:45	11:00–13:00	10:30–13:00	10:30–13:00	Not provided	10:45–13:00



3.2 Consumer priorities and sustainability considerations in the canteen

3.2.1 Dietary and health preferences

The three identified consumer segments differ not only in their general food choice motives, they are also distinct in what they prefer the canteen to provide and how it relates to their food habits at home (Table 5). Respondents in segment 1, with their general focus on personal benefits, seem less prone to trying out new types of food and are less concerned about cooking healthier meals at home, compared to the other two segments. Segment 3, who are oriented toward sustainability in their motives, are also the most influenced by the food in the canteen and the most concerned about healthy cooking at home, when it comes to trying out new dishes they seem in line with the respondents in segment 2.

3.2.2 Convenience, enjoyment, and economic factors

The distinction in canteen preferences between the three segments extends to their perspectives on how easy, practical, enjoyable, and affordable the meal offers should be (Table 6). Somewhat surprising

are the lower scores for the personal benefit consumers in segment 1, on the preference for a relaxing and enjoyable meal, compared to segment 3. Additionally, segment 2 rated offers, promotions, and price in general as significantly less important than segment 3, which again seems at odds with the segment’s profile. With that said, the consumers in segment 3 were generally scoring all aspects higher than the other two segments.

3.2.3 Sustainability concerns

Again, the three consumer segments are distinct in what they consider important in the context of the canteen (see Table 7). Food choice with regards to sustainability is consistent between canteen and at home—where segment 3 rates highest on “trying to eat sustainable food” and segment 1 has the lowest rating. Consistent with the initial clustering, segment 3 placed the highest importance on the different sustainability aspects of the canteen’s offerings, along with the food eaten at home. Segments 1 and 2 were fairly aligned in their preferences for pricing, ordering, and portion sized, yet segment 2 was generally more concerned about the sustainability and origin of their food. In contrast, respondents across segments reported similar association to sustainability in the context of food, as seen in Table 8.



FIGURE 3 Food choice motives characteristic of the three consumer segments identified through clustering.

TABLE 4 Segment demographics, significant differences ($p < 0.05$) between segments are indicated by contrasting letters (A vs. B).

		Segment 1 Personal benefits	Segment 2 Personal benefits and animal welfare	Segment 3 Sustainability motives
Gender	Male	57.1% ^A	45.3% ^{AB}	36.9% ^B
	Female	42.9% ^B	54.7% ^{AB}	63.1% ^A
Age group (in years)	≤ 29	19.4%	16.9%	16.7%
	30–39	27.6%	26.4%	27.5%
	40–49	26.5%	30.3%	30.4%
	50–69	26.5%	26.4%	25.4%
Individual income level	<1.000.000 NOK (≈ €87.000)	73.5%	66.2%	68.8%
	≥ 1.000.000 NOK (≈ €87.000)	19.4%	28.9%	25.4%
	Undisclosed	7.1%	5.0%	5.8%
Educational level	High school, or below	25.6% ^A	12.8% ^B	18% ^{AB}
	University degree, Bachelor or above	74.4% ^B	87.2% ^A	82% ^{AB}
# adults in household	1	35.7%	25.9%	32.6%
	2	50.0%	59.7%	55.1%
	3 or more	14.3%	14.4%	12.3%
# kids in household	None	58.2%	54.2%	54.3%
	1 or more	41.8%	45.8%	45.7%

The only significant differences in these ranked associations were observed for health and plant-based produce, with the first prioritized by more respondents in segment 1 and the latter by fewer respondents in the same segment, compared to the other two segments.

3.3 How do consumer preferences align with more plant-based canteen offers?

3.3.1 Meat reduction and plant-based alternatives

The survey respondents' preferences for plant-based offers align well with their animal welfare and sustainability orientations, or lack thereof. As seen in Table 9, those in segment 1 were consistently less positive to plant-based food in the canteen than segments 2 and 3,

including vegetables, meat replacers, and meat-free days, even when price could be an incentive. At the same time, segment 1 provided the highest ratings on the wish for more meat in the canteens. Although these scores do not tap into the consumers' motives, they are consistent with segment 2's consideration for animal welfare and segment 3's sustainability concern.

3.3.2 Drivers for choosing plant-based dishes in the canteen

The focus groups uncovered that the most important drivers for choosing plant-based food in the workplace canteen are current eating habits, that is, consumers with a vegetarian or vegan lifestyle naturally chose these options in the canteen. Also, eating healthy and considering one's wellbeing can also motivate

TABLE 5 Respondents' dietary and health preferences and attitudes, grouped by segment.

	Segment 1 Personal benefits	Segment 2 Personal benefits and animal welfare	Segment 3 Sustainability motives
I try to eat healthier in the canteen than at home	3.56	3.47	3.79
I try to cook healthier at home than what I eat in the canteen	3.43 ^C	4.01 ^B	4.72 ^A
What I eat in the canteen influences what I eat at home	3.06 ^B	3.49 ^B	3.94 ^A
I usually eat the same type of food at home as in the canteen	3.20	3.12	3.32
My colleagues inspire me to try new foods in the canteen	2.71 ^B	2.98 ^{AB}	3.37 ^A
I dare to try new dishes if available in the canteen	4.87 ^B	5.60 ^A	5.64 ^A

All items were rated on Likert scales ranging from 1, not important, to 7, very important; significant differences ($p < 0.05$) across segments are indicated by contrasting letters (A vs. B vs. C).

TABLE 6 Respondents' preferences and attitudes related to convenience, enjoyment, and economic factors, grouped by segment.

	Segment 1 Personal benefits	Segment 2 Personal benefits and animal welfare	Segment 3 Sustainability motives
What I eat in the canteen is usually driven by offers and promotions	3.09 ^{AB}	2.90 ^B	3.47 ^A
What I eat in the canteen is usually driven by price	3.35 ^{AB}	3.01 ^B	3.72 ^A
It is important to have a fast meal when I eat in the canteen	4.13	3.99	4.17
I want to be full (satiated) after eating in the canteen, so that I do not need such a big meal at home	3.82	3.95	3.98
I relax and enjoy the meals in the canteen	4.34 ^B	4.66 ^{AB}	4.94 ^A

All items were rated on Likert scales ranging from 1, not important, to 7, very important; significant differences ($p < 0.05$) across segments are indicated by contrasting letters (A vs. B).

food choices. Several men highlighted the importance of proteins, both for satiety and building muscles. Particular to the canteen setting, appearance, taste, color and food consistency are central drivers in the choice of plant-based dishes, along with being able to see the ingredients and not just a “mash” of something unrecognizable. One woman said: “*It has to look good and inviting, then it does not matter, I would not choose it because it says vegan but because it looks good.*” Clearly colorful and tempting dishes were preferred and could contribute to choosing even more plant-based meals.

The participants who ate little vegetarian food appreciated the mouthfeel and texture of meat, and many wanted meat substitutes to look like familiar products. Their largest barriers to choosing plant-based dishes in the canteen are the liking, affinity and familiarity with meat, “*when you eat meat, you know what you get,*” together with the small selection of vegetarian dishes on offer. Tradition, well-established food habits and skepticism to trying something new were also mentioned multiple times in the focus groups. Furthermore, several consumers said that they did not choose vegetarian dishes because they were too heavy with cream and cheese. The fact that plant-based dishes are often placed less prominently than the meat appears as an additional barrier. Conversely, those who already adhered to a plant-rich diet would rather avoid meat replacers and pre-processed products. Instead, these consumers would like to have nutritionally complete meals made from scratch.

3.3.3 Encouraging plant-based food choices in the canteen

Following a proposed structure to behavioral change interventions (Attwood et al., 2020), the focus groups touched on outcomes related

to promotion, placement, presentation, and product. The participants suggested the following activities for *promotion* of plant-based dishes: Using internal digital channels (Yammer, FB@work) to talk about the food, share recipes from the canteen, run campaigns/hand out taste samples, and not having a separate “vegetarian” section on the menu but integrate plant-based. In terms of *placement*, the consumers suggested placing plant-based dish first and highly visible and making self-service stations, like the salad bar, more engaging. Regarding *presentation*, the canteen guests would have liked better descriptions of vegetarian dishes using positive adjectives such as tasty or spicy. More tempting and colorful dishes should also motivate plant-based choices, along with communications highlighting climate and sustainability. As for the actual *product*, the participants thought they would be encouraged by dishes that contained pulses, more Norwegian and seasonal ingredients, and did not have strange raw materials and ingredient combinations. Several participants wanted better nutritional content and information for the plant-based dishes. A larger variety of vegetarian dishes would also encourage canteen guests to choose these more often.

3.3.4 Contextual spillover from the canteen to the home

One of the important areas of inquiry in this study was whether and how the canteen can influence consumers' food choices at home and thus contribute to an even bigger change. In the focus groups, we found that guests are inspired by others who choose vegetarian, even tempting them to try the same at home. If canteens supplied recipes for good vegetarian dishes, some thought it would be easier to cook these at home. While consumers make the choice only for themselves in a canteen, several participants described

TABLE 7 Respondents' sustainability concerns, preferences, and attitudes, grouped by segment.

	Segment 1 Personal benefits	Segment 2 Personal benefits and animal welfare	Segment 3 Sustainability motives
I try to eat sustainable food at home	2.92 ^C	4.80 ^B	5.50 ^A
I try to eat sustainable food in the canteen	2.67 ^C	4.32 ^B	4.94 ^A
The origin of the food, or whether it is organic, is important to me when I choose food in the canteen	2.23 ^C	3.57 ^B	4.62 ^A
Pre-ordering lunch in the canteen could help me choose more sustainable	2.85 ^B	3.25 ^B	4.05 ^A
Weight-based pricing of meals in the canteen would help me in reducing food waste	3.60 ^B	3.84 ^B	4.38 ^A
Offering different portion sizes in the canteen would help me in reducing food waste	4.36 ^B	4.62 ^B	5.25 ^A

All items were rated on Likert scales ranging from 1, not important, to 7, very important; significant differences ($p < 0.05$) across segments are indicated by contrasting letters (A vs. B vs. C).

TABLE 8 Most frequently selected respondents' associations with sustainability in the context of food, presented as the overall number of respondents selecting an item as one of the five most important aspects, and as the share of respondents within a segment.

	Number of respondents selecting item as top five ($n = 437$)	Segment 1 Personal benefits ($n = 98$)	Segment 2 Personal benefits and animal welfare ($n = 201$)	Segment 3 Sustainability motives ($n = 138$)
1. Less food waste	304	66	136	102
2. Local food	277	66	127	84
3. Ethical production/farming	265	61	126	78
4. Carbon footprint	232	49	113	70
5. Health	228	63 ^A	95 ^B	70 ^B
6. Animal welfare	217	51	94	72
7. Norwegian raw materials	176	46	73	57
8. More plant-based food	166	26 ^B	84 ^A	56 ^A
9. Less meat	164	31	85	48
10. Organic	124	24	55	45
11. 100% vegetarian/vegan	32	7	17	8

Significant differences ($p < 0.05$) across segments are indicated by contrasting letters (A vs. B).

their family situation steering what lunch and dinner option at home. People who live alone often had their main meal at the workplace canteen while couples or families with children had their main meal at home, after work: *"Having three children, we traditionally eat hot dinners, so it is usually a salad in the canteen."* As several participants pointed out, Norwegian tradition also speaks for a lighter lunch and a more filling meal later on: *"Salads are more lunch food. More vegetarian at work than at home."* The quality of the meat led some to reserve it for meals at home *"I eat some meat, do not prioritize it in the canteen."* An interesting comment about ethnic food also highlighted that the canteen may have shortcomings regarding good dishes and recipes that are familiar to all of their guests: *"At home, I would have chosen traditional ethnic food; Lebanese, Indian."*

4 Discussion

Food choices can be influenced by external factors, such as policies, social norms, and environmental cues, they are also guided by internal states and other individual factors (European Vegetarian

Union, 2023; Lorenz and Langen, 2018; Onwezen et al., 2019). Accordingly, the motives behind food choices vary both across situations and across individuals, which extends to the importance placed on the sustainability of food options available in the food sectors (Onwezen et al., 2019; Verain et al., 2021). In this context, workplace canteens can provide controlled environments for studying the effects of situational factors on individuals' food choices, also setting the scene for interventions to steer food choice motives toward sustainability. While some real-life implementations have yielded promising outcomes (European Vegetarian Union, 2023), these types of interventions do not always lead to the desired outcome; some consumers remain unaffected (Bianchi et al., 2018), others may even engage in reactive behavior (Lombardini and Lankoski, 2013). Following the sound advice of including the opinions of those involved at an early stage (Lorenz-Walther and Langen, 2020), we addressed canteen consumers' perspectives on current canteen offers, which changes could encourage more sustainable food consumption behavior, and whether canteen habits transferred to the household. Our findings showcase individual differences in food choice motives, both across gender and segments, and they shed light on potentially fruitful means to incorporate

TABLE 9 Respondents' preferences and attitudes related to meat reduction and plant alternatives.

	Segment 1 Personal benefits	Segment 2 Personal benefits and animal welfare	Segment 3 Sustainability motives
I wish there were more plant-based foods in the canteen	2.76 ^B	4.32 ^A	4.67 ^A
I wish there were more vegetable based dishes in the canteen	3.38 ^B	4.73 ^A	5.06 ^A
I wish there were more dishes with plant-based meat replacers (e.g., vegetarian burgers) in the canteen	2.54 ^B	3.63 ^A	4.02 ^A
One meat-free day a week in the canteen is a good idea	3.91 ^B	5.24 ^A	5.48 ^A
If the plant-based alternatives were cheaper than the meat-based ones, I would choose plant-based more often	3.12 ^B	3.92 ^A	4.34 ^A
I wish there were more meat-based foods in the canteen*	3.74 ^A	2.64 ^B	2.91 ^B

All items were rated on Likert scales ranging from 1, not important, to 7, very important; significant differences ($p < 0.05$) across segments are indicated by contrasting letters (A vs. B). *Note the reverse formulation.

sustainability interventions in workplace canteens and other food outlets.

4.1 Food choice motives and sustainability orientations across consumer segments

Three consumer segments were identified from the surveyed food motives, spanning from the food's healthiness, climate impact, and moral implications to its convenience, affordability, and enjoyment; the profile of each segment aligned with the consumers' respective concerns regarding sustainability. The first, and smallest, segment was characterized by motives related to pleasantness and positive mood, as well as healthiness and maintaining weight. The second, and largest, segment was similarly characterized by health and pleasantness motives, but also practicality and animal welfare. Finally, the third segment stood out with its sustainability motives, related to fair trade, climate impact, and waste reduction. Consistent with their motives, consumers in this third segment rated their sustainability concerns higher than the others, both with respect to their food preferences, in the canteen or at home, and with respect to their attitudes to means that might reduce food waste. On items directly addressing eating sustainable or organic food, segment 1 stood out in the opposite direction, while consumers in segment 2 covered the middle ground.

Consumers are not a homogenous group, although some food motives are common to most, others are more variable (Wahl et al., 2020) and likely linked to internal factors such as personal preferences and values (Lorenz and Langen, 2018), as well as external factors such as social norms and environmental cues (Lorenz and Langen, 2018; Onwezen et al., 2019). The consumer segments identified in this work corroborate earlier findings, with only a smaller share of the respondents prioritizing sustainability motives such as climate impact, production waste, and fair trade. This was also the segment with the largest share of female respondents (two thirds). This is consistent with earlier works on gender differences in prioritizing sustainability and choosing alternatives to meat (Abel and Totland, 2021; Hielkema et al., 2022). While age and educational level did not stand out for the sustainability segment, there were fewer respondents with university degrees in the personal benefits segment (Abel and Totland, 2021).

4.2 Canteens going green: encouraging plant-based food choices

Diets oriented toward sustainability should reduce meat consumption and increase the intake of plant-based alternatives (Willett et al., 2019), which was reflected in the consumer segments' attitudes to plant-based meals. Segments 2 and 3, aligned, respectively, toward animal welfare and sustainability, were more positive to all the plant-based canteen offers, vegetables, meat replacers, or meat-free days; conversely, segment 1 expressed a comparatively stronger wish for more meat in the canteen. The focus groups corroborated these results. Participants expressed that current eating habits were their main dietary drivers, with those opting for vegetarian or vegan lifestyles making consistent choices in the canteen, and those motivated by healthy and nutritious diets doing so across food settings. Alongside their seeming reluctance to embrace a more sustainable diet in the workplace canteen, segment 1 also reported significantly lower willingness to explore new dishes in the canteen compared to segments 2 and 3. These observations uncover a potential pitfall for canteens transitioning toward a more plant-based selection, they may run the risk of losing consumers due to reactance (Lombardini and Lankoski, 2013).

With respect to promoting new options, the focus groups spoke in favor of emphasizing the positive aspects of plant-based dishes, much in line with recommendations to enhance the visual or descriptive appeal (Attwood et al., 2020; Bianchi et al., 2018) and to use sensory, geographic, or nostalgic name labels (Ohlhausen and Langen, 2020). The prevailing opinions were also to avoid promoting the vegetarian status of a dish, or grouping these options in a separate menu section, particularly when the goal is to include omnivorous consumers in the dietary shift. This feedback coincides with previous studies that encourage the use of nudging and social marketing strategies (Bianchi et al., 2018; Krpan and Houtsma, 2020; Langen et al., 2022; Ohlhausen and Langen, 2020), and which have shown that effects can be lasting (Bianchi et al., 2018; Lombardini and Lankoski, 2013; Velema et al., 2018). Also consistent with earlier findings, the focus groups highlighted the placement and selection of plant-based dishes, with some participants expressing preferences for familiar foods rather than meat replacers (Varela et al., 2022) and some arguing for making them more prominent (Bianchi et al., 2018; Langen et al., 2022).

4.3 Consumers going green: taking the message home

One of the important questions of this study was whether and how the food offered in workplace canteens can influence consumers' food choices at home. With such a contextual spillover, the change toward more sustainable, healthy, and plant-based foods would go beyond the canteen setting. So far, research in this domain has mainly inquired about how the offered meal choices influence nutritional and sustainability related aspects in the canteen (Attwood et al., 2020; Hielkema et al., 2022; Lorenz-Walther and Langen, 2020). However, a few studies have demonstrated contextual spillovers from the canteen to the home both for healthy (Lassen et al., 2011) and meat-reduced food options (Lachat et al., 2009; Lassen et al., 2011; Poulsen and Jørgensen, 2010; Verfuërth et al., 2021). Not surprisingly, the connections between consumers' food-related behavior and sustainability concerns were consistent between the canteen and home setting, across all segments; this suggests that their attitudes to sustainability do not depend on the context but are likely founded in personal values. Consumers who are oriented toward sustainability in their choice motives, are also the most influenced by the food in the canteen and the most concerned about healthy cooking at home, particularly for segment 3. At the same time, many are open to trying new dishes in the canteen and at home. Inspiration from colleagues who follow a vegetarian diet can motivate others to choose more plant-based dishes. Because of the better quality of meat consumers can buy and prepare themselves, some do not eat meat in the canteen but only at home.

Participants' family situation and food preferences strongly influenced choices in the canteen and at home, consistent with earlier studies (Lorenz and Langen, 2018; Onwezen et al., 2019; Varela et al., 2022). Single households rely more on the canteen for their main meal, whereas those who live with a family may choose a salad for lunch and instead prioritize a warm dinner in commensality with the household. Hopefully, choosing the green option in the canteen will not serve as a justification for a sufficient daily plant intake, which could have negative bearings for the family meal. Still, canteens can contribute to a positive dietary change through several means, for example offering new dishes that may spur curiosity of canteen guests or handing out recipes on plant-based or ethnic dishes. This might however not work for consumers in segment 1, as they are less interested in trying out new dishes and are less concerned about cooking healthy or sustainable meals at home. This opens the door to investigate the interplay between canteen and in-home consumption further.

4.4 Recommendations, implementations, and future research

By grouping consumers into segments based on distinct sustainability orientations, food choice motives, and meal preferences, our study accentuates the potential benefit of adopting multiple strategies when planning sustainability interventions, in canteens and elsewhere. The many means available have been thoroughly documented by others, including appealing, positive, and varied presentations and descriptions, and nudging through strategic menu design, default options, and re-structured environments (Attwood et al., 2020; Bianchi et al., 2018; Krpan and Houtsma, 2020; Langen et al., 2022; Lorenz-Walther and

Langen, 2020; Ohlhausen and Langen, 2020; Pandey et al., 2023; Perez-Cueto, 2021; Taufik et al., 2022; Zhang et al., 2022). Our findings also showcase that males are over-represented in the segment prioritizing personal benefits, indicating a need to emphasize benefits other than a product's climate-friendliness, for instance the food's origin, quality, sensory appeal, or sociocultural significance. Our focus groups corroborated the importance of sensory and nutritional quality, suggesting that canteen guests' interest in plant-based dishes could be drawn by appealing, positive, and varied presentations and descriptions. To better understand which interventional means hold the most potential for persuasion, we need to extend the current body of research with studies that take the step from consumer segmentation to targeted interventions. Because the limitation of food choices may create tensions, there is also need for careful planning, monitoring, and stakeholder involvement in the food sectors (Mikkelsen et al., 2021). This underscores the important role that canteens can play in testing interventions and mandating vegetarian offerings in canteens and other outlets, promoting consumer autonomy while shifting dietary behaviors. The EU, and other authorities, acknowledge the potential of canteens in the green shift, through existing strategies built on evidence-based information for promoting green and plant-based meals (Boyano Larriba et al., 2019). Informed by the insights derived from this and related works (Attwood et al., 2020; Lacroix and Gifford, 2020; Langen et al., 2022), future research could consider innovation adoption approaches to facilitate sustainable and plant-based food choices; in so doing, canteens and other food venues will be equipped to uncover and endorse the relative advantage, compatibility, trialability, and observability of sustainable options, as well as reducing their complexity (Gonera et al., 2021). Involving consumers in a co-creative process has the potential to make the canteen change more interesting and relevant (Bentsen and Pedersen, 2021; Sijtsma and Snoek, 2023).

5 Conclusion

There exists no single consensus among consumers on the importance of different food choice motives, nor in preferences for sustainable and plant-based options. The three consumer segments identified in this work are generally motivated by personal benefits, by both benefits and animal welfare, and by sustainability. While the latter segment will presumably only need available options to make environmentally friendly choices, the other two may need targeted and distinct approaches to facilitate food choices and behaviors that lessen the planetary impact. One thing that most seemed to agree on, was the advantage of promoting a dish's appeal over its lack of meat. Regardless of the approach, we have observed that effective communication regarding food offerings is crucial and presents significant room for improvement in workplace canteens. By incorporating the consumer perspective in future innovations that promote the green shift, canteens can boost their potential as arenas for change, hopefully extending beyond the workplace over time.

6 Limitations

Methodologies that rely on subjective memory and tap into self-representation are vulnerable to omissions and biases, yet they are also the best suited for scoping out the preferences and perspectives of

specific target groups. In this work, we sought out the food-related motives, attitudes and preferences of regular canteen customers and their responses should not be generalized to other populations. Furthermore, since workplace canteens host people that work together, their viewpoints may be similar; this potential issue we have strived to diminish by recruiting from 19 different canteens. Another challenge in this type of research is that the recruited sample could reflect the most eager, engaged, and/or dutiful, it can be hard to reach those who do not normally expose themselves in their work situation or have no opinion or obligation toward the topic (Lucas and Buzzanell, 2004). We were unable to recruit blue-collar canteen guests to the survey and focus groups, which is reflected in the much larger number of office workers than hands-on workers in Table 1. In consequence, this adds further limitations to the study's generalizability.

Data availability statement

The datasets presented in this article are not readily available because of reasons related to GDPR and proprietary information. Depending on the purpose, parts of the data set may still be shared upon request. Requests to access the datasets should be directed to antje.gonera@nofima.no.

Ethics statement

The studies involving humans were approved by Nofima's Ethical Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

RE: Conceptualization, Formal analysis, Writing – original draft. AG: Conceptualization, Formal analysis, Funding acquisition, Investigation, Project administration, Writing – review & editing. ISG: Formal analysis, Investigation, Methodology, Writing – review & editing. MEP: Formal analysis, Investigation, Methodology,

Writing – review & editing. PV: Conceptualization, Investigation, Methodology, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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