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Finding flexitarians: Current studies on meat eaters and meat reducers

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ABSTRACT

Background: Much scientific evidence has been found about positive effects of lowering meat consumption on the environment, human health and animal welfare. Nevertheless, particularly in developing economies demand for meat is rising whereas in high-income countries meat intake remains at high levels. Although many of today's Western consumers are unwilling to cut their meat consumption, it appears that a fraction is receptive to limit meat consumption by abstaining from eating meat occasionally. This is called flexitarianism. A great deal of hope has been placed lately on a flexitarian diet to help solving food-related environmental sustainability and human health problems. To determine whether flexitarianism can meet such high hopes, it is – to begin with – important to get an idea about the extent of contemporary food consumers' shift towards more meat-restricted diets. Such an overview has so far been lacking.

Scope and approach: This study collected recent consumer research on meat eaters and meat reducers conducted in various affluent countries to explore the state of play in the field of flexitarianism.

Key findings and conclusions: The present work demonstrates that multiple studies point to the existence of a group of flexitarians that is distinct from consumers who are deeply attached to meat eating and have no intention whatsoever to limit their meat intake, let alone are already changing meat-eating behaviours. Flexitarians not only differ from meat lovers but they also differ from each other. Against the backdrop of numerous devoted meat eaters, and flexitarians who frequently reduce their meat consumption only slightly, the question is raised whether flexitarianism is enough to tackle the pressing environmental and human health problems.

1. Introduction

Shifting away from meat-heavy diets towards diets containing more plant-based foods is broadly considered to be beneficial to both planetary and personal health. Although adverse impacts on environmental sustainability and human health are often considered the main arguments for the need for a significant reduction in meat production and consumption, essentially the same applies to animal welfare (Allievi, Vinnari, & Luukkanen, 2015; Mathur et al., 2020) and global food security (de Boer & Aiking, 2011; Morris et al., 2021). In the past few decades a vast amount of research has provided overwhelming scientific evidence about the urgent need to rebalance plant and animal ratios in Western diets. This has culminated recently in a number of prestigious studies (Godfray et al., 2018; Poore & Nemecek, 2018; Springmann et al., 2018; Tilman & Clark, 2014; Willett et al., 2019). Their common denominator is that switching to diets with lower animal source foods – particularly meat consumption is a contentious issue – has both public health benefits (reduction of disease risks) and environmental gains

(reduction of GHG emissions, land required, biodiversity impact). In other words, diets with a high proportion of animal-based foods threaten planet's carrying capacity and people's health.

Nevertheless, consumers around the world seem to be attracted to such unsustainable diets. Since the middle of the twentieth century the animal protein consumption (meat, eggs, dairy, fish) has drastically increased whereas plant-based foods (vegetables, fruits, pulses, nuts, grains, seeds) have reduced in percentage. This tendency is part of a broader process known as the nutrition transition. The concept of nutrition transition has been developed by Popkin (e.g. Popkin, 2004) and refers to worldwide changes in physical activity patterns and dietary behaviours. With respect to the first, the concept points more specifically to a rise in sedentary lifestyles. With respect to the latter, rising meat intakes are an important aspect of the nutrition transition. Popkin himself stated that meat and meat products are main sources of animal source foods (ASF) and higher ASF consumption plays a major role in the diet shifts covered by the concept of nutrition transition (Popkin & Du, 2003). This “meatification of the diet” has taken place at first in the

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Global North, followed by a worldwide proliferation in the course of time. In the past decades the meat-rich consumption pattern has advanced not so much in high-income countries but especially in non-Western countries, such as China and Indonesia (Whitnall & Pitts, 2019; Sahlin, Rööös, & Gordon, 2020). This dietary transition is fuelled by a growing number of people in the middle classes who can afford to purchase and eat meat regularly for functional (nutritional), sensory (taste) and symbolic (status) reasons. Diets change with increased wealth. More specifically, when people become more wealthy, meat intakes change. As a result, in growing economies a convincing dietary change in accordance with the nutrition transition is evolving featuring increasing demand for animal-based foods.

A reverse and more reluctant dietary shift (“a second nutrition transition” – Vranken, Avermaete, Petalios, & Mathijs, 2014) arises in high-income countries away from animal protein products towards plant-based foods. Given that the first-mentioned nutrition transition applies to approximately 70 per cent of the world population, this one is not only much bigger than the latter but also dramatically faster. The counterbalancing trend towards reducing meat consumption in Europe and North America is a slowly emerging one – by itself insufficient to solve the problem of worrisome levels of global meat demand exceeding planetary boundaries or to downplay the estimated high increases in global demand for animal sourced proteins. This is neither to negate the utter importance of moderating the Western (over-)consumption of animal-based foods nor the need to make concomitant changes towards more plant-rich diets and food patterns containing more alternative proteins overall (Onwezen, Bouwman, Reinders, & Dagevos, 2021; Taufik, Verain, Bouwman, & Reinders, 2019; van der Weele, Feindt, van der Goot, van Mierlo, & van Boekel, 2019). On the contrary, there is a strong case for a reverse nutrition transition – or protein transition, as it is currently known (Aiking & de Boer, 2020; Tziva, Negro, Kalfagianni, & Hekkert, 2020). The protein transition is about respecting environmental limits rather than outpacing our planet’s resources, and is also about following national dietary guidelines rather than ignoring these health recommendations.

1.1. Flexitarianism: a food consumption pattern away from meat-heavy diets

Reduction in our intake of meat products is paramount to this protein shift, first of all in rich-world consumer diets, which are characterised by excess consumption of animal products, such as meat, largely above levels of dietary recommendations. In a dietary transition in which reducing overall meat consumption and replacing meat products with plant (protein) products are pivotal while it is simultaneously not necessary to become fully vegetarian and stop eating meat altogether, flexitarianism enters the picture. The two R’s of reducing and replacing are incorporated in flexitarianism, which may be defined as a food consumption pattern in which meat is eaten occasionally without avoiding it completely. In contrast to the original (Anglo-Saxon) interpretation of flexitarianism taking vegetarianism as its starting point – a flexitarian is a vegetarian who still eats meat on occasion, see Rosenfeld (2018); Rosenfeld, Rothgerber, and Tomiyama (2020a) –, the (European) definition of flexitarianism used here (and elsewhere, see Dagevos, 2014; Dagevos, 2016; Forestell, Spaeth, & Kane, 2012; Malek & Umberger, 2021; Raphaely & Marinova, 2014; Verain, Dagevos, & Antonides, 2015) gives priority to a meat-eating perspective. Flexitarianism, then, means meat reduction on a part-time basis, and by the same token, a flexitarian abstains from eating meat occasionally without abandoning meat totally – in contrast to vegetarians who follow a meat-free diet and vegans who follow a strict plant-based diet and abstain from consuming all animal-based foods. Likewise, a more meat-reduced diet is also key in the definition of the cognate term *reducetarian*, described as a person who is deliberately reducing his or her consumption of meat (Kateman, 2017).

Although a flexitarian diet has no agreed-upon definition and its

dietary framework remains open for interpretation about the degree of meat reduction, a low-meat flexitarian diet is recently considered most helpful to bring co-benefits to the tall environmental and health challenges we are facing. After an earlier study by Hedenus, Wirsenius, and Johansson (2014), more recently Springmann et al. (2018; see also IPCC, 2019) refer explicitly to a flexitarian diet as an important dietary change that significantly contributes to reducing the environmental footprint of the food system and providing more healthy eating patterns and nutritional benefits to food consumers. These studies define a flexitarian dietary pattern as predominantly plant-based complemented with modest amounts of animal foods (meat, dairy, fish). Both Hedenus et al. (2014) and Springmann et al. (2018) also explicitly and firmly conclude that ambitious human dietary change towards reduced meat and dairy consumption is required. In other words, agrotechnology and productivity improvements are important but supply-side measures alone will not be enough to solve food-related ecological and health problems of today and tomorrow – a position that has gained much momentum in recent years (see e.g. Bianchi, Garnett, Dorsel, Aveyard, & Jebb, 2018; Biermann & Rau, 2020; de Bakker & Dagevos, 2012; Ekins, Gupta, & Boileau, 2019; Garnett, Mathewson, Angelides, & Borthwick, 2015; Graça, Godinho, & Truninger, 2019; Gwozdz, Reisch, & Thøgersen, 2020; Mason & Lang, 2017; Verain et al., 2015). At present, broad agreement exists within the research community that major demand-side change is both crucial and indispensable. More specifically, a shift away from meat-heavy to more plant-rich, more flexitarian, diets is deemed urgently needed, and critically important to – as mentioned above – environmental sustainability, human health, animal welfare and global food security. Mason and Lang (2017) par excellence point out that consumption should not be ignored in making the food system more sustainable. They emphasise that tackling food-related ecological and health problems is particularly a consumption challenge in which curtailment of meat intake is regarded as a vital step towards a sustainable diet.

1.2. The present study: context, contribution, and content

In keeping with this tradition, the present study supports a consumption-oriented perspective. This point of view adds to prominent studies by Springmann et al. (2018) and Willett et al. (2019) in the sense that such studies rightly address the issue of lowering high levels of meat consumption (reduction) and changing dietary preferences (replacing) with respect to meat intake – and animal-sourced foods generally – as a prominent feature to help mitigating the serious threats current food consumption patterns pose to available resources of planet Earth and on humans’ health conditions, but it remains unclear how many consumers are inclined to make this dietary shift, to what extent flexitarianism is emerging currently, or whether or not different forms of flexitarianism could be distinguished. In other words, in the high-level studies just referred to a flexitarian diet is mainly regarded as contributory to solving human nutritional and sustainability problems rather than as a research problem and subject of investigation itself. Unlike the focus of the present work, in these studies only limited attention is paid to the issue of whether and to what extent contemporary food consumers are shifting towards lower meat diets. In this context the present work is complementary.

Consumer studies on meat reduction confirm to a certain degree the line of reasoning by scholars like Springmann or Willett who argue that transitioning to a low-meat diet is first and foremost important for environmental sustainability and human health reasons. Such motives are echoed in modern studies on flexitarianism. Studies by Apostolidis and McLeay, 2019, Lacroix and Gifford (2019), Lai, Tiroto, Pagliaro, and Fornara (2020), or Verain et al. (2015), for instance, demonstrated that both sustainability and health are among the important drivers of reducing meat consumption. Several other studies (e.g. Cheah, Shimul, Liang, & Phau, 2020; De Backer & Hudders, 2014; Lentz, Connelly, Miroso, & Jowett, 2018; Malek, Umberger, & Goddard, 2019a), found that health is a main motivator in consuming less meat. Although other

motives such as weight control, price/affordability, or ethical concerns with farm animal suffering have been addressed too, insights and research on meat moderation motivations remain limited so far (Kemper, 2020; Malek & Umberger, forthcoming). Recently, Graça, Godinho, and Truninger (2019) pointed out that this holds even more for the two other components of the Motivation-Opportunity-Capability-model: studies devoted to variables in the domains of capabilities and opportunities in the field of meat reduction and plant-based diets exist even less. However important it is to gain further understanding in the motivations, capabilities and opportunities that promote or hinder meat moderation of different (sub)groups of consumers, these issues are left for future research. The current work agrees with a comment by Hielkema and Lund (2021) that “it is a valuable first step to map the share of consumers that are willing to reduce their meat consumption”. The present study, then, contributes with gauging the extent to which contemporary food consumers are moving into flexitarian directions. The contribution of the overview reported in this study is to show how (i.e. classification criteria) and how many (i.e. sample size) flexitarians as a group are distinguished from other dietary forms. A differentiation that is in some cases further refined to intra-group segments.

With a focus on the diffusion of flexitarianism in the Western world and with the knowledge that this is the first overview study that seeks to get a more clear and up-to-date picture of the size of the flexitarians as a distinct food consumer segment, recent studies were collected. Based on their broad coverage of academic studies the search engines Elsevier’s Scopus and Google Scholar were used for identifying relevant literature for the purpose of the present work. The studies included have been collected by conducting various literature searches on both databases during 2020 using search terms like “flexitarian diet”, “meat diet”, “reducing meat consumption” or “meat reduction”, and using a period from 2019 onwards. Tacit knowledge of the author on this research domain was also helpful in adding and assessing relevant studies.

Papers containing specific information on the number of flexitarians based on empirical evidence were primarily selected for inclusion into the overview that is reported at the heart of this study (Subsections 2.2–3.3). Section 2 has meat eaters at its core and clearly shows that it is anything but self-evident that consumer intentions or actual food practices are aimed at decreasing meat intake. Section 3 switches attention to meat reducers and reveals that, despite strong meat cravings, also signals of emergent flexitarianism can be detected. In the closing section (Section 4) we wonder whether flexitarianism is enough to lessen planetary and human health problems, and whether the high expectations about a flexitarian diet can be met.

2. Established meat practices

Convincing evidence exists about the need for dietary change away from meat-rich diets and towards more plant-based diets. Diets high in red and processed meat and low in vegetables, fruit, cereals, legumes and nuts are unsustainable, both in terms of environmental impact and health risks (González, Marquès, Nadal, & Domingo, 2020; Springmann et al., 2020). Despite all scientific evidence and scholarly consensus about what a healthy and sustainable dietary pattern consists of, in current practice mostly only small minorities of food consumers turn out to be able to meet such dietary recommendations. This indicates clearly that it must be expected that moving to a flexitarian diet style in which meat intake is limited to some degree is considered a dramatic dietary shift to many people. This implies that irrespective of the consensus about what a sustainable diet generally is, it is much less clear and uncontroversial how willing and helpful consumers could be to drive the transition to meat-restricted diets and dishes.

2.1. An enabling environment for meat-eating

Reducing and replacing meat is not easy because, to begin with, meat has deep and historically grown roots in food culture and food

consumption practices (Beardsworth & Keil, 1997; Fiddes, 1991; Fresco, 2015; Smil, 2013). Often meat gets a special place, not merely for nutritional reasons, i.e. moderate meat intake provides important nutrients and is recommended by dietary guidelines, but especially because meat is a symbolic food with considerable identity value, next to the sensory pleasures of eating meat. In line with the latter is the finding that the enjoyment of eating meat is a main barrier to many people to switch to more plant-based diets (He et al., 2019). Many subscribe to the both vague and firm idea that “our meat eating is something very deep indeed” (Pollan, 2006). In multiple sociocultural ways and repertoires people are attached to meat and consider it normal, necessary, natural and nice (Graça, Calheiros, & Oliveira, 2015; Oleschuk, Johnston, & Baumann, 2019; Piazza et al., 2015).

This “meat culture” is continuously confirmed by massive advertising and promotion. In retail, special offers on meat products often serve to attract customers and make the meaty choice the easy choice: this includes supermarkets offering discounts for meat products as well as places to eat with special offers on meat dishes, such as “all you can eat”, for items such as spare ribs, schnitzels or steaks. All this facilitates the sociocultural significance of eating meat, consumer commitment to meat consumption behaviour and “masculine” motivations to continue eating meat. But also at home and out of home meat is the centrepiece of a meal. Regardless of whether we dine in a fast-food restaurant or a high-end restaurant, meat tends to dominate the menu. Salient characteristics of both the physical/material and sociocultural food environment continue to favour and foster meat-eating behaviours and are unfavourable to the normalisation of flexitarian habits and to reduce the quantity of meat consumed.

Moreover, we are dealing with characteristics of the social and physical context which are cultivated and defended by vested commercial interests, by an economic growth paradigm, by prevailing neoliberal principles of freedom of choice and race to the bottom, as well as by alleged consumer rights of hedonism and as much choice as possible (see for the latter also Graça, Truninger, Junqueira, & Schmidt, 2019). One could add to all this the reluctance politicians and policy-makers commonly have as yet to take the meat problem seriously by looking this “cow in the room” (Jones & Taylor, 2019) in the face and taking appropriate measures subsequently to curb rising meat consumption (Dagevos & Voordouw, 2013; Dagevos & Reinders, 2018), and pay tribute to Sustainable Development Goals such as SDG12 “Responsible consumption and production” (Dagevos, Tolonen, & Quist, 2019).

Even a glimpse at such conditions and countervailing powers reveals that it is no wonder that the global trend, as already mentioned, shows that we globally eat ever more meat whereas trying to limit meat intake, making low-meat and meatless diets more popular, or increasing susceptibility to “the problematisation of meat eating” (Maye, Fellenor, Potter, Urquhart, & Barnett, 2021) are like fighting an uphill battle (for further elaborations on the variety and importance of contextual influences on eating behaviours, and more specifically, on obstacles hampering a transition towards less animal-based, more flexitarian diets, see e.g. Graça, Godinho, & Truninger, 2019; Harguess, Crespo, & Hong, 2020; Marcone, Madan, & Grodzinski, 2020; Niva, Vainio, & Jallinoja, 2017; Stoll-Kleemann & Schmidt, 2017; Vinnari & Vinnari, 2014).

2.2. Meat lovers

Apart from various hindrances impeding flexitarianism to flourish, habitual food consumption behaviour as such is notoriously difficult to change (see Vermeir et al., 2020 for a recent review article on this topic). This especially holds for meat consumption behaviour too due to, as just pointed out, the central place of meat on our plates and its much-appreciated and deeply-engrained position in (Western) diets and food cultures. Contextual and motivational impediments reinforce each other. Various consumer studies attest to this when much reluctance is found among food consumers to change their customary meat

consumption pattern – and confirm in this way a remark made by Cheah et al. (2020): “To change one’s eating habits such as reducing one’s meat consumption as a dietary behaviour is extremely challenging.” Carnivorous consumer unwillingness to dietary change into more flexitarian directions is not encouraged as long as many consumers turn out to be relatively unaware of environmental and health-related reasons to do so (systematic reviews on this issue are: Hartmann & Siegrist, 2017; Sanchez-Sabate & Sabaté, 2019) – reasons that are so clearly spoken out in scholarly discourse.

An early study by Lea and co-authors (2006) already obtained results which, in retrospect, turn out to prelude to findings of later studies, as it was found that 58 per cent of the 415 Australian survey respondents neither considered changing their food behaviour in favour of a more plant-based diet nor defined their current food behaviour problematic. This study concluded “that a large proportion of the population is not yet ready to consume a more plant-based diet” (Lea, Crawford, & Worsley, 2006), with only a tiny fraction (2 per cent) of the studied population actually seeking to make dietary shifts into this direction. Similar conclusions have been drawn since then. For example in a Finnish study by Latvala et al. (2012) examining meat consumption patterns. This research found a large consumer segment (48 per cent) consisting of respondents who had no intention whatsoever to change their established meat consumption pattern. In a recent Danish study by Hielkema and Lund (2021) a majority consumer group of 57 per cent were unwilling to reduce their meat intake. A Belgian study by Vanhonacker, Van Loo, Gellynck, and Verbeke (2013) identified among its five distinct consumer segments based on meat consumption frequency two segments (representing 41 per cent of the sample) with high levels of meat consumption and unreadiness to shift away from their meat-rich diets. In a similar vein, considerable opposition of participants to break away from prevalent meat-eating conventions in favour of a reduced meat diet have been found in other studies as well. For example, studies conducted in respectively New Zealand (Lentz et al., 2018; Tucker, 2014), the Netherlands (Schösler, de Boer, & Boersema, 2012; Verain et al., 2015) and Scotland (Macdiarmid, Douglas, & Campbell, 2015) all suggest that it will be hard to reduce meat intake and shift away from meat-centred diets as the evidence indicates that many consumers express considerable doubt or even resistance to moderating personal meat consumption. Corresponding findings are provided in more recent studies.

An Australian study from 2019, for instance, yields a consistent finding to the idea that many consumers are meat lovers and have low willingness to change meat consumption behaviour in terms of reducing or replacing meat: a large fraction (55 per cent) of the respondents state that they like to consume meat as they are used to do and have no intention to change their high meat consumption in the near future (Marinova & Bogueva, 2019). Among the 287 meat-eating respondents in another Australian study from 2019, the largest group (46 per cent) turned out to be the so-called committed meat eaters who are unwilling to reduce their meat consumption or to consider to replace meat by making changes towards more plant-based protein consumption (Malek, Umberger, & Goddard, 2019b). A follow-up study found that approximately 75 percent of the sample identified as so-called unrestricted omnivores, which are participants with strong dietary preferences for meat and animal-source foods generally and corresponding consumption frequencies (Malek & Umberger, 2021).

In two Canadian studies performed by Lacroix and Gifford (2019; 2020) the largest consumer group (47 per cent and 49 per cent respectively), labelled as strong-hindrance meat eaters, consists of meat-attached individuals who eat meat frequently, hardly opt for eating plant-based meals and are not inclined to incorporate more meat-free days in their diet. Consumer unwillingness to change personal meat consumption patterns into more flexitarian directions also results from other current research. A 2020 systematic literature review by Harguess et al. (2020) confirms that it is still valid today to realise that consumers continue to have strong preferences for meat: this study demonstrates clearly that reducing meat consumption and altering

intentions to do so appear to be not self-evident to contemporary food consumers. In accordance, recent studies also found that a majority of participating consumers reported no change in their meat consumption frequency (Dagevos, 2014; Horgan, Scalco, Craig, Whybrow, & Macdiarmid, 2019; Malek & Umberger, 2021; Malek et al., 2019b).

Studies in the neighbouring countries Germany and Switzerland found respectively that more than half of the German population studied consumed more meat than recommended by the German Nutrition Society (almost three-quarters of the male participants and less than half of the women were classified high meat consumers eating meat above the recommended level) (Koch, Heuer, Krems, & Claupein, 2019), and almost a quarter of the respondents from the Swiss city of Lucerne had never considered reducing their meat consumption (Weibel, Ohnmacht, Schaffner, & Kossmann, 2019), while another Swiss study demonstrated that a vast majority (82 per cent) of the respondents’ (self-reported) meat intake amply exceeded recommended meat consumption levels (Hagmann, Siegrist, & Hartmann, 2019).

Overall, the above-mentioned results underpin the conclusion of a literature review by Hartmann and Siegrist (2017): “consumer’s willingness to reduce their meat consumption is generally low” (see also Hartmann & Siegrist, 2020).

3. Emergent flexitarianism

The other side of such results, however, is that simultaneously a portion of present-day food consumers are purposefully reducing their meat consumption without eliminating meat and becoming a vegetarian or vegan. Although it is unknown how many flexitarians already existed in recent history (for one reason because the term as such was not used, and the modest number of related studies around the last turn of the century spoke about partial-, pseudo- or semi-vegetarians – see Verain et al., 2015), since the last decade a blossoming field of research adds to a body of evidence that flexitarians constitute a genuine food consumer segment. Empirical studies from various countries, ranging from several European countries to Australia and New Zealand to Canada and the United States, found that a considerable amount of food consumers regularly abstain from meat for several days per week. The notions of flexitarianism and flexitarian have also started to appear in the titles of scientific work (e.g. Clicerri, Spinelli, Dinnella, Prescott, & Monteleone, 2018; Curtain & Grafenauer, 2019; Dagevos, 2016; Dagevos & Reinders, 2018; Derbyshire, 2017; Duckett, Lorenzo-Arribas, Horgan, & Conniff, 2020; Forestell, 2018; Kemper & White, 2021; Malek, Umberger, forthcoming; Raphaely & Marinova, 2014; Spencer, Cienfuegos, & Guinard, 2018; Verain Dagevos, & Jaspers, forthcoming; Wozniak et al., 2020).

3.1. Flexitarianism: a blossoming field of study

From the viewpoint of a recent upsurge in research on flexitarianism, it is specifically observed that the above-mentioned Finnish study finds that 13 per cent of participants has made a shift towards less meat and more vegetable consumption in the past year whereas 39 per cent of the participating consumers report that they are in the middle of a change towards decreasing their meat consumption behaviour (Latvala et al., 2012). Likewise, the just-mentioned Australian study by Marinova and Bogueva (2019) demonstrated that a proportion (12 per cent) of the Sydney research population has positive intentions to reduce their meat intake or exclude meat altogether. The Australian study by Malek and co-authors (2019b), in turn, found that 22 per cent of the sample comprised of willing meat reducers who adhered less to a meaty diet and declared themselves ready to make reductions in their personal meat consumption. Another relevant study by Malek and Umberger (2021) identified almost 20 per cent of their sample as meat reducers, who are accustomed to eat meat-free main meals, who believe that meat-free eating is – also nutritionally – an adequate food choice, and report to have a meat dish for dinner for three days a week at most. This

percentage is comparable with the 18.9 per cent of a sample of Australian participants in a study by [Estell, Hughes, and Grafenauer \(2021\)](#) indicating that their current eating pattern was best described by the term flexitarian.

Also a study in another high-meat consumption nation, i.e. the USA ([Neff et al., 2018](#)), discovered that a significant number of participants (66 per cent) reported reducing meat consumption, particularly reductions of red and processed meat, in comparison to three years ago. In the successive studies executed by [Lacroix and Gifford \(2019; 2020\)](#) 14 per cent (2019 study) and 11 per cent (2020 study) in the samples of adult Canadians ($n = 355$ and $n = 377$ respectively) were assigned to the group of meat reducers, who reported having already made conscious efforts to reduce their meat intake, and were motivated by health, ethical and environmental reasons to further change their diet. A study from New Zealand assigned 312 out of 841 respondents to the consumer group of reducers (i.e. approximately 37 per cent of the sample, that also included a consumer group ($n = 25$) of so-called abstainers) ([Lentz et al., 2018](#)). Also conducted recently in New Zealand is a qualitative study highlighting the presence of a variety of motivations to cut down on meat, resulting from discussions in six focus groups with 36 participants in total ([Kemper, 2020](#)). Of a comparable explorative nature is a UK study observing a number of positive motivations, opinions and experiences related to reducing meat intake among the twenty interviewees ([Mylan, 2018](#)). Another recent UK-based study also hints at participants' likelihood to pursue gradual dietary changes supportive to meat reduction in everyday food consumption practices ([Grassian, 2020](#)).

An exploratory Danish study, in which segmentation was based on attitudes towards adopting and eating plant-based foods, showed that 220 respondents of a total sample of 462 Danish consumers (i.e. almost 48 per cent) belonged to a segment characterised by holding positive attitudes to a plant-based diet. In addition, a majority (52 per cent) of the respondents intended to adopt a more plant-based diet ([Reipurth, Hørby, Gregersen, 2020](#)).

A study devoted to consumer willingness to reduce meat consumption and their willingness to shift towards a more plant-based diet found that consumers differed in their level of meat attachment ([Graça et al., 2015](#)). It was shown that consumers with lower levels of meat attachment are more inclined to change their meat dietary pattern away from meat-rich habits whereas consumers higher in meat attachment appear to eat meat more often, have stronger preferences for meat, and are less likely to restrict meat eating and to change towards a more flexitarian diet. Such findings were confirmed in a Portuguese study by [Possidónio, Prada, Graça, and Piazza \(2021\)](#) that revealed a majority group of committed meat eaters (almost 56 per cent) with a high meat attachment profile that consisted of plain positive preferences towards meat consumption and negative ones towards plant-based meat alternatives, as well as a minority cluster of consumers (26 per cent) with a lower meat attachment profile because of a dietary orientation that is less enthusiastic about eating (red) meat and more open to plant-based meat alternatives for health-oriented reasons.

A newly-published Swiss study by [Wozniak and co-authors \(2020\)](#) found that almost 16 per cent of the studied population from Geneva could be defined as flexitarian, and that this percentage remained stable over the period of survey from 2005 to 2017, in which each year about 1,000 adult participants were involved (adding up to a total of 10,797 participants). Much potential for flexitarianism is also suggested by another Swiss study, showing high percentages of meat reducers amongst the 1,818 respondents: more than 41 per cent reported that they occasionally eat less meat and a quarter indicated that they are in the phase of change in which consuming little to no meat is taken for granted ([Weibel et al., 2019](#)). A survey study performed in the German and French-speaking regions of Switzerland also found a substantial number of self-declared low-meat eaters: almost a third ($n = 1296$) of a subsample of self-identified omnivores reported to deliberately eat little or no meat ([Hagmann et al., 2019](#)).

This subjective self-perception, however, does not automatically

imply that meat consumption levels meet official dietary recommendations: it turned out that the self-reported meat intake of only a quarter of these self-declared low-meat consumers fell within the recommended dietary guidelines (see also [Malek & Umberger, 2021](#); and [Subsection 3.2](#) below). Related research is a study by [Koch et al. \(2019\)](#) in which low-meat consumers are defined as people who do not exceed the maximum meat intake officially recommended by national dietary guidelines. Although the word flexitarianism is not used in this German study, [Raphaely and Marinova \(2014\)](#) specifically define flexitarianism as the reduction of individual meat consumption to recommended healthy dietary guidelines. Taken together, participants classified as low-meat eaters ($n = 5404$) could be identified as flexitarians and comprised more than 42 per cent of the total sample ($n = 12,733$) of the second German National Nutrition Survey ([Koch et al., 2019](#)). A German study by [Biermann and Rau \(2020\)](#) came to half such a percentage: approximately 21 per cent of their 420 respondents could be labelled flexitarian. This corresponds with the percentage found by [Michel, Hartmann, and Siegrist \(2021\)](#): the percentage of their German participants ($n = 1,039$) who self-identified as flexitarian was 20 per cent ($n = 203$). In a recent survey study on cultured meat a quarter of the French respondents ($n = 1,000$) and 30 per cent of the German respondents ($n = 1,000$) identified as flexitarian, and unrestricted omnivores were even a minority (45 per cent) in the German sample. Additionally, almost half of the German and French meat-eating respondents intend to (further) reduce their meat intake in the near future ([Bryant, Van Nek, & Rolland, 2020](#)). In another recent study in several countries ([Michel, Knaapilia, Hartmann & Siegrist, 2021](#)) it was observed that a quarter (24.7 per cent) of the German and around a sixth (15.9 per cent) of the French respondents indicated that the term flexitarian best described their diet. The UK was also included in this study: out of 562 only 61 (10.9 per cent) of the UK participants indicated that flexitarian is the best term to express their diet style.

3.2. Identifying different flexitarians

In the above-mentioned studies no differences were made between meat reducers or flexitarians in terms of stages of willingness and commitment to reduced meat consumption. In the following studies differences between flexitarians were made.

In a sample ($n = 2055$) representative of the French adult population, flexitarians were differentiated from so-called "pro-flexitarians" ([De Gavelle et al., 2019](#)). A difference between the group of 129 flexitarians (6.3 per cent) and the group of 381 pro-flexitarians (18.2 per cent) is that the first have moderated their consumption of red and processed meat more substantially than the medium meat-eating pro-flexitarians. Other differences are that pro-flexitarians do not declare themselves flexitarians per se but nonetheless are seriously considering reducing their meat intake (particularly beef and pork) in favour of higher intake of plant-based foods (particularly vegetables and legumes) primarily for environmental sustainability reasons, while flexitarians are already more used to consume meatless dishes and are motivated to follow a less animal-based and more plant-based diet primarily for personal health and animal welfare reasons.

In line with the above-mentioned Belgian study by [Vanhonacker et al. \(2013\)](#) that also identified a consumer segment with relatively low meat consumption frequency – the so-called Active segment covered 19 per cent of a sample of 221 Flemish respondents – [De Backer and Hudders](#), in turn, emphasised that flexitarians constitute a separate group of consumers ([De Backer & Hudders, 2015](#)) that could also be split into a group of semi-vegetarians whose meat-intake frequency is two days a week at the most, and a group of light semi-vegetarians who are identified by eating meat three days a week or more ([De Backer & Hudders, 2014](#)). The flexitarians in the 2015-study comprised 28 per cent of the sample. This percentage is close to what [Bryant and Santorum \(2021\)](#) more recently reported: around a third of the Belgian consumers self-identified flexitarian in their two waves survey of 2019

and 2020.

Notably, this distinction criterion of meat frequency was also used in Dutch studies in which flexitarians were distinguished in different segments based either entirely or partly on the frequency of meat eating (Dagevos & Voordouw, 2013; Verain et al., 2015). Particularly the study executed by Verain et al. (2015) revealed that next to dominant consumer clusters of so-called light and medium flexitarians with higher meat consumption frequencies, more positive attitudes to eating meat and less appreciation of meatless meals, also a clear-cut consumer cluster of heavy flexitarians could be distinguished, representing consumers with relatively positive attitudes towards limiting meat consumption and meatless meals, who “practiced what they preached” by reporting relatively moderate levels of meat consumption frequency. The meat consumption frequency characteristics of light flexitarians are identical to the light semi-vegetarians who mildly reduce their meat intake by having one or two meatless days a week. The segment that is termed semi-vegetarians in the Belgian study by De Backer and Hudders is closely related to more meat-reduced diets of medium and heavy flexitarians who figure in Dutch studies.

Data obtained in 2011 showed that flexitarianism consists of different forms or levels, ranging from minor adjustments to regular meat consumption patterns to more structural departure from routinised meat eating practices (Dagevos & Voordouw, 2013; Verain et al., 2015). Successive survey research conducted in 2019 confirmed this (Verain et al., forthcoming). However, it was simultaneously found that the percentage of heavy flexitarians (classification based on a self-reported weekly meat consumption frequency of 1 or 2 times per week meat for dinner) decreased from more than 15 per cent in 2011 to less than 10 per cent in 2019, while the percentage of light flexitarians (based on a meat frequency of 5 or 6 times per week meat for dinner) increased from 36 per cent in 2011 to 41 per cent. Such figures contribute to a slightly higher average in the number of days in which meat was eaten at dinner: from 4.6 days a week (2011) to 4.8 days a week (2019). And this outcome could be reconciled with the fact that per capita meat consumption in the Netherlands has been stable between 2011 and 2019 at approximately 39 kg. All this suggests that flexitarianism has made little progress in the past 10 years – at least, when it comes to overt behaviour.

Counterbalancing results are that medium flexitarians (half of the week a meatless dinner) turned out to be group of considerable and constant size (comprising about 30 per cent of the samples in 2011 and 2019), and that many Dutch food consumers described themselves as flexitarian. In comparison to 2011, when only 13 per cent of the Dutch meat-eating consumers identified themselves as flexitarian, this percentage rose substantially to almost 43 per cent in 2019. The paradoxical results of a rising flexitarian self-identification in combination with high and stable levels of self-reported number of days in which meat is eaten, is confirmed by another recent Dutch study (Onwezen, Kunz, Dagevos, & Verain, 2020).

Two other recent studies reported intra-group differences among flexitarians. By using a stages of behavioural change approach, Hielkema and Lund (2021) divided meat reducers into a subgroup of meat reducers in the fourth and fifth stage of change respectively. The fourth stage is the action stage and refers to a recent change in new behaviour. The fifth and final stage is the stage of maintenance in which new behaviour has been implemented. In this stage eating meat-free hot meals have become part of habitual food consumption behaviour resulting in substantial reduction in meat intake, according to the authors' estimate. Meat reducers in the action stage comprised 13.3 per cent of the total sample ($n = 1005$), and meat reducers in the maintenance stage covered 14.3 per cent.

An Australian study by Malek and Umberger (forthcoming) concentrated specifically on flexitarians. Hence, the sample of this study ($n = 717$) contained only flexitarian consumers, not omnivores or vegetarians. Based on differences in meat consumption frequency three subgroups were distinguished. The flexitarians who reported the highest level of meat restriction (a meat consumption pattern that included 1–3

times meat per month on average) were termed heavy meat reducers (13 per cent of the flexitarian sample). Moderate meat reducers, in turn, consist a larger subgroup (36 per cent) and, on average, eat weekly two times a meal with meat. Light meat reducers are the largest subgroup (50 per cent) and maintain the lowest level of meat restriction (eating meat for at least 4 days/week, on average). This segment of light meat reducers is further subdivided by Malek and Umberger into three distinct subsegments showing different flexitarian dietary patterns (i.e. higher meat consumption frequency, differences in types of meat eaten). Light meat reducers turned out to differ in their consumption frequency of meat and/or eating habits concerning the consumption of specific types of meat. Such a subdivision reveals that it is possible to identify even more heterogeneity among flexitarians. It is shown as well that it is possible to base distinctions on other classification criteria than solely on consumption frequency of meat, but also on willingness to further reduce meat intake or on motivations underlying meat moderation. This Australian study by Malek and Umberger demonstrated, for instance, that heavy meat reducers are relatively more willing to further reduce their meat consumption compared with other flexitarians, or are more motivated by animal welfare concerns to follow a flexitarian diet. The forthcoming studies by Malek and Umberger and by Verain, Dagevos and Jaspers have in common that both are aiming at further exploring intra-group distinctions among flexitarian consumers in more sophisticated ways.

3.3. Flexitarians found

Extant literature on meat consumption demonstrated unmistakably that the strength and priority of food consumers' receptivity to meat moderation vary, not only between passionate meat lovers and dedicated flexitarians but also among flexitarians. Flexitarians appear to be not necessarily a unified group but rather constitute different groups. Mostly amid a majority of devoted meat eaters, current research is providing increasing evidence for the presence of a distinct category of flexitarians. Table 1 displays a global overview of our exploratory search for flexitarians in recent studies.

4. A few closing conclusions and reflections on flexitarianism

In our objective to find flexitarians we came across multiple recent studies from various affluent countries revealing that flexitarianism is not a fringe behaviour. Consumer studies in recent years yield to the overall view that in various high-income countries segments of contemporary food consumers are somehow changing their meat eating behaviour and restricting their intake. Flexitarians were found, the diffusion of flexitarianism is underway – regardless of the finding that current studies also hint at meat as the centrepiece of a meal and confirm the presence of large consumer groups who are deeply attached to meat and have little-to-no intention to change their habitual consumption pattern with high meat rates. Moreover, the latter helps to distinguish flexitarians as food consumers who curtail their meat intake by abstaining from eating meat occasionally without fully abandoning meat.

Flexitarians turned out to exist as a distinct middle category in between unrestricted meat aficionados and full meat avoiders. This outcome accords with other current findings (Kemper & White, 2021; Malek & Umberger, 2021; Rosenfeld, Rothgerber, & Tomiyama, 2020a, 2020b). Simultaneously, flexitarians are not a homogeneous group per se. Flexitarianism is not a uniform food style; not a strict diet. Flexitarianism is about eating meat in moderation, but the degree in which differs – the variable definition of flexitarianism, as indicated in Sub-section 1.1 and further illustrated in Section 3 and Table 1, also allows this variety among flexitarians who differ in their motivations and support for meat-reduced diets. Two avenues of research open up. One on studying motivational, psychological and demographical differences between flexitarians and meat lovers on the one hand and vegetarians

Table 1
Flexitarians found in recent studies.

Study	Country	Definition/classification based on	Sample size (n)	Flexitarians found (rounded % of sample)
Marinova and Bogueva (2019)	Australia	Positive intentions to reduce meat intake or exclude meat completely.	380	12
Malek et al. (2019b)	Australia	Self-reported willingness to reduce meat and ready to make further reductions in personal meat consumption.	287	22
Malek and Umberger (2021)	Australia	Having a meat dish for dinner for three days a week at most: used to eat meat-free main meals.	2,797	20
Malek & Umberger (forthcoming)	Australia	Self-reported meat consumption frequency, consumption of specific types of meat, willingness to further reduce meat intake.	717 (all flexitarians)	13 (Heavy meat reducers) 36 (Moderate meat reducers) 50 (Light meat reducers)
Estell et al. (2021)	Australia	Participants' response to short description of diet types and were asked to indicate which term best describes their current diet.	660	19
Neff et al. (2018)	USA	Participants described themselves as having reduced consumption of particularly red and processed meat compared with previous years.	1,112	66
Lacroix and Gifford (2019)	Canada	Participants had already made conscious efforts to reduce their meat intake, and are motivated to further change to a meat-reduced diet.	355	14
Lacroix and Gifford (2020)	Canada	Segmentation on 19 profiling variables, among which were dependence on meat, liking the taste of meat, health and ethical beliefs about meat, conformity, food neophobia, etc.	377	11
Lentz et al. (2018)	New Zealand	Differences between food consumer groups based on a survey including questions about perceived environmental friendliness of consuming less meat, motivations for reduction, Meat-Attachment Questionnaire scales, Theory of Planned Behaviour components, statements about government actions to promote meat reduction, and demographics.	841	37
Reipurth et al. (2019)	Denmark	Participants characterised by holding positive attitudes to a plant-based diet.	462	48
Hielkema and Lund (2021)	Denmark	Differences between stages of change based on food items consumed in main meals per week ((red) meat, vegetarian) resulting in reduction in meat intake.	1005	13 (Meat reducers in action stage) 14 (Meat reducers in maintenance stage)
Possidónio et al. (2021)	Portugal	Meat-attachment profile that is more/less enthusiastic about eating (red) meat and more/less open to plant-based meat alternatives.	129	26
Wozniak et al. (2020)	Switzerland	Participants were classified on the Food Frequency Questionnaire results based on multiple food items.	10,797	16
Weibel et al. (2019)	Switzerland	Self-reported meat consumption frequency, and agreement with consuming little to no meat as normal.	1,818	41
Hagmann et al. (2019)	Switzerland	Self-reported support for intentionally eating little to no meat.	4,213	31
Koch et al. (2019)	Germany	Maximum meat intake that is officially recommended by national dietary guidelines is taken as criterion to make a distinction between low-meat eaters (below maximum) and heavy meat eaters (exceed maximum).	12,733	42
Biermann and Rau (2020)	Germany	Participants' self-classification in one of five dietary groups presented (vegans, non-vegan vegetarians, pescetarians, flexitarians, omnivores).	420	21
Michel et al. (2021)	Germany	Participants' self-identification as flexitarian.	1,039	20
Michel, Knaapila, Hartmann, & Siegrist (2021)	Germany UK	Participants' response to brief explanation of diet style that best described the current eating pattern in their opinion.	567	25
De Gavelle et al. (2019)	France	Level of red and processed meat moderation, and stage of willingness to reduce meat intake and to follow a less animal-based and more plant-based diet.	562	11
De Backer and Hudders (2014)	Belgium	Self-reported weekly meat consumption frequency.	605	16
De Backer and Hudders (2015)	Belgium	Self-reported weekly meat consumption frequency.	2,055	6 (Flexitarians) 18 (Pro-flexitarians) 42 (Semi-vegetarians) 48 (Light semi-vegetarians)
Dagevos and Voordouw (2013)	The Netherlands	Self-reported weekly meat consumption frequency.	1,556	299
Verain et al. (2015)	The Netherlands	Differences between food consumer groups based on a survey including questions concerning past, current and intended meat consumption, various questions related to norms, perceptions and opinions about eating meat and meat substitution.	1,253	15 (Heavy flexitarians) 29 (Medium flexitarians) 36 (Light flexitarians)
Verain, Dagevos, & Jaspers (forthcoming)	The Netherlands	Self-reported weekly meat consumption frequency. Identification of different flexitarian segments through various meat-related psychographics, meat-related questions, socio-psychological concepts, and several demographics.	1,253	10 (Conscious flexitarians) 10 (Potential flexitarians) 39 (Unconscious flexitarians)
			1,9791,935	10 (Heavy flexitarians) 30 (Medium flexitarians) 41 (Light flexitarians) 14 (Conscious flexitarians) 18 (Potential flexitarians) 40 (Unconscious flexitarians)

and vegans on the other. Current studies have already begun to explore this new avenue of research (Hopwood, Rosenfeld, Chen, & Bleidorn, 2021; Lentz et al., 2018; Malek & Umberger, 2021; Rosenfeld, Rothgerber, & Tomiyama, 2020a, 2020b). The second one has a focus on differences within the consumer group of flexitarians (Malek & Umberger, forthcoming; Verain et al., 2015; Verain, Dagevos, & Jaspers,

forthcoming).

The existence of flexitarianism is positive from a sustainable and healthy diet point of view. The Introduction explained that a dietary shift away from excessive consumption of (red and processed) meat products has been linked to reducing global warming, avoiding further environmental degradation as well as associated with health benefits.

When a flexitarian diet is considered an important way to lessen the health and environmental burden of our food choices, it is unsurprising that it has received growing attention lately. Expectations have also risen because a flexitarian diet is assumed to offer a relatively easy-to-implement dietary shift. That is, unlike a more restrictive vegetarian or vegan diet a flexitarian dietary pattern implies a less strict framework that permits the consumption of modest amounts of animal-based foods. Within the spectrum of the increasing worldwide appetite for meat, the number of people who are committed to meat and really do like eating it at one end, and the lack of a major increase in the number of people who are willing to give up eating meat entirely and choose unconditionally for a vegetarian or vegan food style at the other, cutting down on meat consumption with the “flexibility” that a flexitarian diet offers becomes a feasible and reasonable “third” way to follow. Regarding the latter, Rosenfeld et al. (2020a) noted: “flexitarians challenge conventionally “all or nothing” views on vegetarian versus omnivorous dietary patterns.” Briefly put, flexitarianism seems digestible to many. It is unsurprising, then, that flexitarianism has been brought forward in high-profile studies as promising to achieve healthier and more sustainable eating patterns (Springmann et al., 2018; Willett et al., 2019). Likewise, it is no surprise that the potential impact of flexitarianism on shifting the balance to lower levels of meat consumption has been recognised at an earlier stage (Dagevos & Voordouw, 2013; de Bakker & Dagevos, 2012; Raphaely & Marinova, 2014).

However enticing a flexitarian diet may be for food consumers, and without denying that an implementation of a flexitarian diet in many wealthy countries with food abundance would be an effective tool in reducing the health and environmental burden of our global food choices, the question remains whether flexitarianism is enough. As indicated earlier (Dagevos, 2016), the answer to this question depends on one’s point of view, or to paraphrase Singer and Mason (2006): it depends on whether it is believed to be more appropriate to praise flexitarians for how far they have come or rather criticise them for not having gone further. Of course, these two different responses are not necessarily mutually exclusive.

The findings of this study suggest that for many contemporary food consumers flexitarianism means a modest dietary shift in meat eating. Taking this “consumption change pathway” (Ekins et al., 2019) does often not lead to drastic meat restrictions and the adoption of a low-meat diet. For instance, neither Malek and Umberger (forthcoming) nor Verain and colleagues (forthcoming) could escape the conclusion that a majority of flexitarians still consume meat on ≥ 3 days/week. More generally, Subsection 3.2 demonstrated that self-identified flexitarians eat meat frequently and hardly break away from routinised meat consumption patterns. Compared to 2011 it was also shown that 2019 flexitarians in the Netherlands labelled themselves more often as flexitarian but their overall level of meat restriction has decreased. This puzzling mix of self-identification and meat eating frequency suggests some kind of inflation of the notion that is unfavourable to give an affirmative answer to the question just raised. Furthermore, the studies collected in the present work show that flexitarians form a consumer segment of considerable size but represent usually a minority.

There is reason though to continue to place hope in flexitarianism because making gradual steps in food behavioural change requires less effort than following a stricter plant-based diet, and is, consequently, more readily acceptable to a greater number of consumers. A step-by-step approach is undeniably an important behavioural strategy to encourage people to alter their dietary status quo (Hielkema & Lund, 2021; Grassian, 2020; Lacroix & Gifford, 2020; Raghoebar, van Kleef, & de Vet, 2020). From a behavioural perspective flexitarianism could be beneficial because a flexitarian diet does not prescribe a major protein shift in terms of eliminating meat completely. From the perspective of the pressing human health and environmental sustainability problems – next to ethical merits regarding livestock and global food provisioning – there is need for a more radical transition in Western meat conventions than flexitarianism light. In current practice, however, flexitarianism is

frequently a matter of incremental behavioural change (limited meat moderation) rather than significant reductions in meat consumption (meat curtailment) that decisively depart from the overconsumption of meat. The latter, no doubt, is what the protein transition first and foremost stands for (Aiking & de Boer, 2020).

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References

- Aiking, H., & de Boer, J. (2020). The next protein transition. *Trends in Food Science & Technology*, 105, 515–522.
- Allievi, F., Vinnari, M., & Luukkanen, J. (2015). Meat consumption and production – analysis of efficiency, sufficiency and consistency of global trends. *Journal of Cleaner Production*, 92, 142–151.
- Apostolidis, C., & McLeay, F. (2019). To meat or not to meat? Comparing empowered meat consumers’ and anti-consumers’ preferences for sustainability labels. *Food Quality and Preference*, 77, 109–122.
- de Bakker, E., & Dagevos, H. (2012). Reducing meat consumption in today’s consumer society: Questioning the citizen-consumer gap. *Journal of Agricultural and Environmental Ethics*, 25, 877–894.
- Beardsworth, A., & Keil, T. (1997). *Sociology on the menu: An invitation to the study of food and society*. London: Routledge.
- Bianchi, F., Garnett, E., Dorsel, C., Aveyard, P., & Jebb, S. A. (2018). Restructuring physical micro-environments to reduce the demand for meat: A systematic review and qualitative comparative analysis. *Lancet Planetary Health*, 2, e384–397.
- Biermann, G., & Rau, H. (2020). The meaning of meat: (Un)sustainable eating practices at home and out of home. *Appetite*, 153, 104730.
- de Boer, J., & Aiking, H. (2011). On the merits of plant-based proteins for global food security: Marrying macro and micro perspectives. *Ecological Economics*, 70, 1259–1265.
- Bryant, C., & Sanctorem, H. (2021). Alternative proteins, evolving attitudes: Comparing consumer attitudes to plant-based and cultured meat in Belgium in two consecutive years. *Appetite*, 161, 105161.
- Bryant, C., Van Nek, L., & Rolland, N. C. M. (2020). European markets for cultured meat: A comparison of Germany and France. *Foods*, 9, 1152.
- Cheah, I., Shimul, A. S., Liang, J., & Phau, I. (2020). Drivers and barriers toward reducing meat consumption. *Appetite*, 149, Article 104636.
- Clicerio, D., Spinelli, S., Dinnella, C., Prescott, J., & Monteleone, E. (2018). The influence of psychological traits, beliefs and taste responsiveness on implicit attitudes toward plant- and animal-based dishes among vegetarians, flexitarians and omnivores. *Food Quality and Preference*, 68, 276–291.
- Curtain, F., & Grafenauer, S. (2019). Plant-based meat substitutes in the flexitarian age: An audit of products on supermarket shelves. *Nutrients*, 11, 2603.
- Dagevos, H. (2014). Flexibility in the frequency of meat consumption: Empirical evidence from The Netherlands. *EuroChoices*, 13, 40–45.
- Dagevos, H. (2016). Exploring flexitarianism: Meat reduction in a meat-centred food culture. In T. Raphaely, & D. Marinova (Eds.), *Impact of meat consumption on health and environmental sustainability* (pp. 233–243). Hershey, PA: IGI Global.
- Dagevos, H., & Reinders, M. J. (2018). Flexitarianism and social marketing: Reflections on eating meat in moderation. In D. Bogueva, D. Marinova, & T. Raphaely (Eds.), *Handbook of research on social marketing and its influence on animal origin food product consumption* (pp. 105–120). Hershey, PA: IGI Global.
- Dagevos, H., Tolonen, E., & Quist, J. (2019). Building a market for new meat alternatives: Business activity and consumer appetite in The Netherlands. In D. Bogueva, D. Marinova, T. Raphaely, & K. Schmidinger (Eds.), *Environmental, health, and business opportunities in the new meat alternatives market* (pp. 183–210). Hershey, PA: IGI Global.
- Dagevos, H., & Voordouw, J. (2013). Sustainability and meat consumption: Is reduction realistic? *Sustainability: Science, Practice and Policy*, 9, 60–69.
- De Backer, C. J. S., & Hudders, L. (2014). From meatless Mondays to meatless Sundays: Motivations for meat reduction among vegetarians and semi-vegetarians who mildly or significantly reduce their meat intake. *Ecology of Food and Nutrition*, 53, 639–657.
- De Backer, C. J. S., & Hudders, L. (2015). Meat morals: Relationship between meat consumption consumer attitudes towards human and animal welfare and moral behavior. *Meat Science*, 99, 68–74.
- De Gavelle, E., Davidenko, O., Fouillet, H., Delarue, J., Darcel, N., Huneau, J.-F., et al. (2019). Self-declared attitudes and beliefs regarding protein sources are a good prediction of the degree of transition to a low-meat diet in France. *Appetite*, 142, Article 104345.
- Derbyshire, E. J. (2017). Flexitarian diets and health: A review of the evidence-based literature. *Frontiers in Nutrition*, 3, 55.
- Duckett, D. G., Lorenzo-Arribas, A., Horgan, G., & Conniff, A. (2020). Amplification without the event: The rise of the flexitarian. *Journal of Risk Research*. <https://doi.org/10.1080/13669877.2020.1800066>

- Ekins, P., Gupta, J., & Boileau, P. (Eds.). (2019). *Global environment outlook – GEO 6: Healthy planet, healthy people*. Cambridge: Cambridge University Press/United Nations Environment Programme (UNEP).
- Estell, M., Hughes, J., & Grafenauer, S. (2021). Plant protein and plant-based meat alternatives: Consumer and nutrition professional attitudes and perceptions. *Sustainability*, 13, 1478.
- Fiddes, N. (1991). *Meat: A natural symbol*. London: Routledge.
- Forestell, C. A. (2018). Flexitarian diet and weight control: Healthy or risky eating behavior? *Frontiers in Nutrition*, 5. <https://doi.org/10.3389/fnut.2018.00059>
- Forestell, C. A., Spaeth, A. M., & Kane, S. A. (2012). To eat or not to eat red meat: A closer look at the relationship between restrained eating and vegetarianism in college females. *Appetite*, 58, 319–325.
- Fresco, L. O. (2015). *Hamburgers in paradise: The stories behind the food we eat*. Princeton: Princeton University Press.
- Garnett, T., Mathewson, S., Angelides, P., & Borthwick, F. (2015). *Policies and actions to shift eating patterns: What works? – a review of the evidence of the effectiveness of interventions aimed at shifting diets in more sustainable and healthy directions*. Oxford: Food Climate Research Network/Chatham House.
- Godfray, H. C. J., Aveyard, P., Garnett, T., Hall, J. W., Key, T. J., Lorimer, J., et al. (2018). Meat consumption, health, and the environment. *Science*, 361, 243.
- González, N., Marqués, M., Nadal, M., & Domingo, J. L. (2020). Meat consumption: Which are the current global risks? A review of recent (2010–2020) evidences. *Food Research International*, 137, Article 109341.
- Grassian, D. T. (2020). The dietary behaviors of participants in UK-based meat reduction and vegan campaigns – a longitudinal, mixed-methods study. *Appetite*, 154, Article 104788.
- Graça, J., Calheiros, M. M., & Oliveira, A. (2015). Attached to meat?: (Un)willingness and intentions to adopt a more plant-based diet. *Appetite*, 95, 113–125.
- Graça, J., Godinho, C. A., & Truninger, M. (2019a). Reducing meat consumption and following plant-based diets: Current evidence and future directions to inform integrated transitions. *Trends in Food Science & Technology*, 91, 380–390.
- Graça, J., Truninger, M., Junqueira, L., & Schmidt, L. (2019b). Consumption orientations may support (or hinder) transitions to more plant-based diets. *Appetite*, 140, 19–26.
- Gwozd, W., Reisch, L. A., & Thøgersen, J. (2020). Behaviour change for sustainable consumption. *Journal of Consumer Policy*, 43, 249–253.
- Hagmann, D., Siegrist, M., & Hartmann, C. (2019). Meat avoidance: Motives, alternative proteins and diet quality in a sample of Swiss consumers. *Public Health Nutrition*, 22, 2448–2459.
- Harguess, J. M., Crespo, N. C., & Hong, M. Y. (2020). Strategies to reduce meat consumption: A systematic literature review of experimental studies. *Appetite*, 144, 104478.
- Hartmann, C., & Siegrist, M. (2017). Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. *Trends in Food Science & Technology*, 61, 11–25.
- Hartmann, C., & Siegrist, M. (2020). Our daily meat: Justification, moral evaluation and willingness to substitute. *Food Quality and Preference*, 80, Article 103799.
- Hedenus, F., Wirsenius, S., & Johansson, D. J. A. (2014). The importance of reduced meat and dairy consumption for meeting stringent climate change targets. *Climate Change*, 124, 79–91.
- He, J., Evans, N. M., Liu, H., & Shao, S. (2019). A review of research on plant-based meat alternatives: Driving forces, history, manufacturing, and consumer attitudes. *Critical Reviews in Food Science and Food Safety*, 19, 2639–2656.
- Hielkema, M. H., & Lund, T. B. (2021). Reducing meat consumption in meat-loving Denmark: Exploring willingness, behavior, barriers and drivers. *Food Quality and Preference*, 93, Article 104257.
- Hopwood, C. J., Rosenfeld, D., Chen, S., & Bleidorn, W. (2021). An investigation of plant-based dietary motives among vegetarians and omnivores. *Collabra: Psychology*, 7, Article 19010.
- Horgan, G. W., Scalco, A., Craig, T., Whybrow, S., & Macdiarmid, J. L. (2019). Social, temporal and situational influences on meat consumption in the UK population. *Appetite*, 138, 1–9.
- IPCC. (2019). Chapter 5: Food security. In *Climate Change and land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* (pp. 1–200). Geneva: Intergovernmental Panel on Climate Change.
- Jones, D., & Taylor, J. S. (2019). *The cow in the room: A call for policy for sustainable diets*. London: Feedback.
- Kateman, B. (2017). Introduction. In B. Kateman (Ed.), *The redudctarian solution: How the surprisingly simple act of reducing the amount of meat in your diet can transform your health and the planet* (pp. xv–xviii). New York: TarcherPerigee.
- Kemper, J. A. (2020). Motivations, barriers, and strategies for meat reduction at different family lifecycle stages. *Appetite*, 150, Article 104644.
- Kemper, J. A., & White, S. K. (2021). Young adult's experience with flexitarianism: The 4Cs. *Appetite*, 160, Article 105073.
- Koch, F., Heuer, T., Krems, C., & Claupein, E. (2019). Meat consumers and non-meat consumers in Germany: A characterisation based on results of the German national nutrition survey II. *Journal of Nutrition Sciences*, 8, Article e21.
- Lacroix, K., & Gifford, R. (2019). Reducing meat consumption: Identifying group-specific inhibitors using latent profile analysis. *Appetite*, 138, 233–241.
- Lacroix, K., & Gifford, R. (2020). Targeting interventions to distinct meat-eating groups reduces meat consumption. *Food Quality and Preference*, 86, Article 103997.
- Lai, A. E., Tirotto, F. A., Pagliaro, S., & Fornara, F. (2020). Two sides of the same coin: Environmental and health concern pathways toward meat consumption. *Frontiers in Psychology*, 11, Article 578582.
- Latvala, T., Niva, M., Mäkelä, J., Pouta, E., Heikkilä, J., Kotro, J., et al. (2012). Diversifying meat consumption patterns: Consumers' self-reported past behaviour and intentions for change. *Meat Science*, 92, 71–77.
- Lea, E. J., Crawford, D., & Worsley, A. (2006). Consumers' readiness to eat a plant-based diet. *European Journal of Clinical Nutrition*, 60, 342–351.
- Lentz, G., Connelly, S., Miroso, M., & Jowett, T. (2018). Gauging attitudes and behaviours: Meat consumption and potential reduction. *Appetite*, 127, 230–241.
- Macdiarmid, J. L., Douglas, F., & Campbell, J. (2015). Eating like there's no tomorrow: Public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. *Appetite*, 96, 487–493.
- Malek, L., & Umberger, W. J. (forthcoming). How flexible are flexitarians?: Examining diversity in dietary patterns, motivations and future intentions.
- Malek, L., & Umberger, W. J. (2021). Distinguishing meat reducers from unrestricted omnivores, vegetarians and vegans: A comprehensive comparison of Australian consumers. *Food Quality and Preference*, 88, Article 104081.
- Malek, L., Umberger, W. J., & Goddard, E. (2019a). Is anti-consumption driving meat consumption changes in Australia? *British Food Journal*, 121, 123–138.
- Malek, L., Umberger, W. J., & Goddard, E. (2019b). Committed vs. uncommitted meat eaters: Understanding willingness to change protein consumption. *Appetite*, 138, 115–126.
- Marcone, M. F., Madan, P., & Grodzinski, B. (2020). An overview of the sociological and environmental factors influencing eating food behavior in Canada. *Frontiers in Nutrition*, 7, 77.
- Marinova, D., & Bogueva, D. (2019). Planetary health and reduction in meat consumption. *Sustainable Earth*, 2, 3.
- Mason, P., & Lang, T. (2017). *Sustainable diets: How ecological nutrition can transform consumption and the food system*. Abingdon: Routledge.
- Mathur, M. B., Robinson, T. N., Reichling, D. B., Gardner, C. D., Nadler, J., Bain, P. A., et al. (2020). Reducing meat consumption by appealing to animal welfare: Protocol for a meta-analysis and theoretical review. *Systematic Reviews*, 9, 3.
- Maye, D., Fellenor, J., Potter, C., Urquhart, J., & Barnett, J. (2021). What's the beef?: Debating meat, matters of concern and the emergence of online issue publics. *Journal of Rural Studies*, 84, 134–146.
- Michel, F., Hartmann, C., & Siegrist, M. (2021a). Consumers' associations, perceptions and acceptance of meat and plant-based meat alternatives. *Food Quality and Preference*, 87, Article 104063.
- Michel, F., Knaapila, A., Hartmann, C., & Siegrist, M. (2021b). A multi-national comparison of meat eaters' attitudes and expectations for burgers containing beef, pea or algae protein. *Food Quality and Preference*, 91, Article 104195.
- Morris, C., Kaljonen, M., Aavik, K., Balázs, B., Cole, M., Coles, B., et al. (2021). Priorities for social science and humanities research on the challenges of moving beyond animal-based food systems. *Humanities and Social Sciences Communications*, 8, 38.
- Mylan, J. (2018). Sustainable consumption in everyday life: A qualitative study of UK consumer experiences of meat reduction. *Sustainability*, 10, 2307.
- Neff, R. A., Edwards, D., Palmer, A., Ramsing, R., Righter, A., & Wolfson, J. (2018). Reducing meat consumption in the USA: A nationally representative survey of attitudes and behaviours. *Public Health Nutrition*, 21, 1835–1844.
- Niva, M., Vainio, A., & Jallinoja, P. (2017). Barriers increasing plant protein consumption in western populations. In F. Mariotti (Ed.), *Vegetarian and plant-based diets in health and disease prevention* (pp. 157–171). London: Academic Press.
- Oleschuk, M., Johnston, J., & Baumann, S. (2019). Maintaining meat: Cultural repertoires and the meat paradox in a diverse socio-cultural context. *Sociological Forum*, 34, 337–360.
- Onwezen, M. C., Bouwman, E. P., Reinders, M. J., & Dagevos, H. (2021). A systematic review on consumer acceptance of alternative proteins: Pulses, algae, insects, plant-based meat alternatives, and cultured meat. *Appetite*, 159, 105058.
- Onwezen, M., Kunz, M., Dagevos, H., & Verain, M. (2020). *Consumers more inclined to eat 'alternative' proteins compared to 2015*. Wageningen: Wageningen Economic Research. <https://edepot.wur.nl/535181>.
- Piazza, J., Ruby, M. B., Loughnan, S., Luong, M., Kulik, J., Watkins, H. N., et al. (2015). Rationalizing meat consumption: The 4Ns. *Appetite*, 91, 114–128.
- Pollan, M. (2006). *The omnivore's dilemma: The search for a perfect meal in a fast-food world*. London: Bloomsbury.
- Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360, 987–992.
- Popkin, B. M. (2004). The nutrition transition: An overview of world patterns of change. *Nutrition Reviews*, 62, S140–S143.
- Popkin, B. M., & Du, S. (2003). Dynamics of the nutrition transition towards the animal food sector and its implications: A worried perspective. *Journal of Nutrition*, 133, 3898S–3906S.
- Possidónio, C., Prada, M., Graça, J., & Piazza, J. (2021). Consumer perceptions of conventional and alternative protein sources: A mixed-method approach with meat and product framing. *Appetite*, 156, Article 104860.
- Raghoobar, S., van Kleef, E., & de Vet, E. (2020). Increasing the proportion of plant-based foods available to shift social consumption norms and food choice among non-vegetarians. *Sustainability*, 12, 5371.
- Raphaely, T., & Marinova, D. (2014). Flexitarianism: Decarbonising through flexible vegetarianism. *Renewable Energy*, 67, 90–97.
- Reipurth, M. F. S., Hørby, L., Gregersen, C. G., Bonke, A., & Perez Cueto, F. J. A. (2019). Barriers and facilitators towards adopting a more plant-based diet in a sample of Danish consumers. *Food Quality and Preference*, 73, 288–292.
- Rosenfeld, D. L. (2018). The psychology of vegetarianism: Recent advances and future directions. *Appetite*, 131, 125–138.
- Rosenfeld, D. L., Rothgerber, H., & Tomiyama, A. J. (2020a). From mostly vegetarian to fully vegetarian: Meat avoidance and the expression of social identity. *Food Quality and Preference*, 85, Article 103963.

- Rosenfeld, D. L., Rothgerber, H., & Tomiyama, A. J. (2020b). Mostly vegetarian, but flexible about it: Investigating how meat-reducers express social identity around their diets. *Social Psychological and Personality Science*, *11*, 406–415.
- Sahlin, K. R., Rööös, E., & Gordon, L. J. (2020). 'Less but better' meat is a sustainability message in need of clarity. *Nature Food*, *1*, 520–522.
- Sanchez-Sabate, R., & Sabaté, J. (2019). Consumer attitudes towards environmental concerns on meat consumption: A systematic review. *International Journal of Environmental Research and Public Health*, *16*, 1220.
- Schösler, H., de Boer, J., & Boersema, J. J. (2012). Can we cut out the meat of the dish?: Constructing consumer-oriented pathways towards meat substitution. *Appetite*, *58*, 39–47.
- Singer, P., & Mason, J. (2006). *The way we eat: Why our food choices matter*. Emmaus: Rodale.
- Smil, V. (2013). *Should we eat meat?: Evolution and consequences of modern carnivory*. Chichester: Wiley-Blackwell.
- Spencer, M., Cienfuegos, C., & Guinard, J.-X. (2018). The Flexitarian Flip™ in university dining venues: Student and adult consumer acceptance of mixed dishes in which animal protein has been partially replaced with plant protein. *Food Quality and Preference*, *68*, 50–63.
- Springmann, M., Clark, M., Mason-D'Croz, D., Wiebe, K., Bodirsky, B. L., et al. (2018). Options for keeping the food system within environmental limits. *Nature*, *562*, 519–525.
- Springmann, M., Spajic, L., Clark, M. A., Poore, J., Herforth, A., et al. (2020). The healthiness and sustainability of national and global food based dietary guidelines: Modelling study. *British Medical Journal*, *370*, Article m2322.
- Stoll-Kleemann, S., & Schmidt, U. J. (2017). Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: A review of influence factors. *Regional Environmental Change*, *17*, 1261–1277.
- Taufik, D., Verain, M. C., Bouwman, E. P., & Reinders, M. J. (2019). Determinants of real-life behavioural interventions to stimulate more plant-based and less animal-based diets: A systematic review. *Trends in Food Science & Technology*, *93*, 281–303.
- Tilman, D., & Clark, M. (2014). Global diets link environmental sustainability and human health. *Nature*, *515*, 518–522.
- Tucker, C. A. (2014). The significance of sensory appeal for reduced meat consumption. *Appetite*, *81*, 168–179.
- Tziva, M., Negro, S. O., Kalfagianni, A., & Hekkert, M. P. (2020). Understanding the protein transition: The rise of plant-based meat substitutes. *Environmental Innovation and Societal Transitions*, *35*, 217–231.
- Vanhonacker, F., Van Loo, E. J., Gellynck, X., & Verbeke, W. (2013). Flemish consumer attitudes towards more sustainable food choices. *Appetite*, *62*, 7–16.
- Verain, M., Dagevos, H., & Antonides, G. (2015). Flexitarianism: A range of sustainable food styles. In L. A. Reisch, & J. Thøgersen (Eds.), *Handbook of research on sustainable consumption* (pp. 209–223). Cheltenham: Edward Elgar Publishing.
- Verain, M. C. D., Dagevos, H., & Jaspers, P. (forthcoming). Flexitarianism in The Netherlands in the 2010 decade: Shifts, consumer segments, and motives.
- Vermeir, I., Weijters, B., De Houwer, J., Geuens, M., Slabbinck, H., Spruyt, A., et al. (2020). Environmentally sustainable food consumption: A review and research agenda from a goal-directed perspective. *Frontiers in Psychology*, *11*, 1603.
- Vinnari, M., & Vinnari, E. (2014). A framework for sustainable transition: The case of plant-based diets. *Journal of Agricultural and Environmental Ethics*, *27*, 369–396.
- Vranken, L., Avermaete, T., Petalios, D., & Mathijs, E. (2014). Curbing global meat consumption: Emerging evidence of a second nutrition transition. *Environmental Science & Policy*, *39*, 95–106.
- van der Weele, C., Feindt, P., van der Goot, A. J., van Mierlo, B., & van Boekel, M. (2019). Meat alternatives: An integrative comparison. *Trends in Food Science & Technology*, *88*, 505–512.
- Weibel, C., Ohnmacht, T., Schaffner, D., & Kossmann, K. (2019). Reducing individual meat consumption: An integrated phase model approach. *Food Quality and Preference*, *73*, 8–18.
- Whitnall, T., & Pitts, N. (2019). Global trends in meat consumption. *Agricultural Commodities*, *9*, 96–99.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., et al. (2019). Food in the anthropocene: The EAT–lancet commission on healthy diets from sustainable food systems. *The Lancet*, *393*(10170), 447–492.
- Wozniak, H., Larpin, C., de Mestral, C., Guessous, I., Reny, J.-L., & Stringhini, S. (2020). Vegetarian, pescatarian and flexitarian diets: Sociodemographic determinants and association with cardiovascular risk factors in a Swiss urban population. *British Journal of Nutrition*, *124*, 844–852.