



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



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ABSTRACT

Reducing meat consumption is central to many of the scientific debates on healthy, sustainable diets because of the high environmental impact of meat production. Missing from these debates are the public perspectives about eating less meat and consideration of cultural and social values associated with meat. The aim of this study was to explore public awareness of the environmental impact of food and their willingness to reduce meat consumption. Twelve focus groups and four individual interviews were conducted with adults from a range of socio-economic groups living in both rural and urban settings in Scotland. Public understanding of the link between food, environment and climate change was explored, with a focus on meat and attitudes towards reducing meat consumption. Data were transcribed and analysed thematically. Three dominant themes emerged: a lack of awareness of the association between meat consumption and climate change, perceptions of personal meat consumption playing a minimal role in the global context of climate change, and resistance to the idea of reducing personal meat consumption. People associated eating meat with pleasure, and described social, personal and cultural values around eating meat. Some people felt they did not need to eat less meat because they had already reduced their consumption or that they only ate small quantities. Scepticism of scientific evidence linking meat and climate change was common. Changing non-food related behaviours was viewed as more acceptable and a greater priority for climate change mitigation. The study highlights the role meat plays in the diet for many people, beyond nutritional needs. If healthy, sustainable dietary habits are to be achieved, cultural, social and personal values around eating meat must be integrated into the development of future dietary recommendations.

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1. Introduction

Production of meat and other animal-based products is associated with a high environmental impact and is contributing to climate change (Hedenus, Wirsenius, Daniel, & Johansson, 2014). For these reasons consumption of animal products in the diet, especially meat, has become central to the scientific debate on sustainable diets. The concept of sustainable diets, however, is complex and multifaceted, described by the Food and Agriculture Organization (FAO) as diets that are nutritionally adequate and healthy, safe, with a low environmental impact, economically fair and affordable, and culturally acceptable (FAO, 2010). Much of the

research to date on sustainable diets has focused on the health and environmental dimensions of sustainable diets and tended to neglect the social and cultural aspects of the diet which will influence people's willingness to change their dietary habits. Previous research on meat consumption has described the paradox of negative attitudes towards the impact of meat on health, environment and animal welfare, but an unwillingness to change dietary habits (Holm & Möhl, 2000; Graça, Calheiros, & Oliveira, 2014).

Meat consumption is a complex and can be an emotive issue. First, it has both positive and negative nutritional attributes. It can be a rich source of nutrients in the diet, providing high quality protein and essential micronutrients, but at the same time diets high in red, specifically processed meat, have been associated with increased risk of some chronic diseases (Micha, Wallace, & Mozaffarian, 2010; Pan et al. 2011; Larsson & Orsini, 2014). Second, in terms of the environment, meat production is placing

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significant pressure on finite global resources, ecosystems and it is contributing to climate change (Rockstrom et al. 2009; Eshel, Shepon, Makov, & Milo, 2014; Bajzeli et al. 2014). Considering climate change, which is only one of many environmental concerns, it is estimated that livestock to account for approximately 14.5% of global anthropogenic greenhouse gas (GHG) emissions (FAO 2006). While many of the climate change mitigation strategies focus on improving efficiency, technological advances and reducing waste in food production, it is increasingly recognised by those working on these solutions that this alone will be insufficient to meet GHG emission reduction targets and that dietary habits will also need to change. This includes reducing meat consumption (Bajzeli et al. 2014; Hedenus et al. 2014).

Research has shown that eating less meat can reduce GHG emissions while still achieving dietary requirements for health (Macdiarmid et al. 2012; Chun Yip, Glenis, & Karnon, 2013; Soret et al. 2014; Biesbroek et al. 2014). These studies have modelled 'ideal' sustainable diets based on objective criteria for environmental and nutritional goals but as yet few have fully taken account of social world of eating, with personal and cultural acceptability of dietary choices. This is particularly important now that some countries are attempting to develop new dietary guidelines to incorporate environmental sustainability (US Department Health and Human Services, 2015). In many societies eating meat is the traditional and dominant eating pattern, with meat having cultural and symbolic meanings (Leroy & Praet, 2015). People eat meat for reasons other than for nutritional needs, such as pleasure, personal identity and to express social and economic status (Fiddes, 1992; Sobal, 2005). The high status of meat, for example, is often seen in countries going through economic transition where eating meat is aspirational and considered a symbol of wealth (Popkin, 2006; Smil, 2002). It is often reported as a gender issue, with eating meat framed in masculinity (Schösler, de Boer, Boersema, & Aiking, 2015). Proposals to reduce meat consumption challenges many of these values and therefore for sustainable diets to be acceptable to the public these values need to be recognised as they present a major challenge to changing dietary habits in the general population (Carlisle & Hanlon, 2014; Richardson, 1994). A recent study concluded technological advances in production of beef production were unlikely to be sufficient to tackle climate change and therefore that there needed to be a reduction in meat consumption, which would provide "multiple environmental benefits of potential, easy to implement dietary changes" (Bajzeli et al. 2014). Some would challenge the assumption that dietary change is easy (Winkler, 2013).

Meat consumption is high in many developed countries and increasing in other parts of the world such as Asia and South America (Allievi, Vinnari, & Luukkanen, 2015). A recent study suggests that in some higher income countries meat consumption may be stabilizing or starting to slowly decline (Vranken, Avermaete, Petalios, & Mathijs, 2014). While this is encouraging more still needs to be done to reduce intakes in these countries, for example meat consumption per capita in the USA and UK (supply per capita) is almost three times and double the global average, respectively (FAOSTAT). In the UK 56% of men and 32% of women eat more than the recommended maximum intake of red meat (Bates et al. 2014), but a recent survey in the UK reported that only a third of respondents say they would be willing to *consider* reducing their meat consumption (Eating Better, 2014). These studies highlights a resistance to eating less meat, but they do not tell us anything about the reason for the reluctance to eat less meat. The aim of this study was to explore in depth public views and perceptions of the environmental impact of food, awareness of the link between climate change and meat, and to gauge the public's opinions about their willingness to eat less meat as part of a more sustainable diet.

2. Materials and methods

Focus group discussions were used to explore public awareness of the environmental impact of food, especially meat, and elicit views on eating less meat. This method was used to stimulate an interactive discussion between participants, and to capture both concurring and opposing views as well as counter arguments on this topic. Twelve focus groups with a total of 83 participants (4–11 participants per group) took place between September 2013 and February 2014. Four individual interviews were carried out with participants who were unable to attend the focus groups. Twelve focus groups were deemed sufficient as saturation was reached, with no new insights or issues around the topic emerging after ten group discussions on this topic.

2.1. Recruitment

A purposive sampling frame was used to recruit adults from high and low socio-economic areas, living in rural and urban settings in Scotland. Socio-economic status was determined using the Scottish Index of Multiple Deprivation (SIMD), which provides a relative measure of deprivation by area based on home postcode. It combines indicators from seven domains including income, employment, health, education, skills and training, housing, geographic access and crime (Scottish Government, 2009). Areas of high deprivation were over sampled because of an anticipated difficulty in recruitment of this population. Participants were grouped into high deprivation (HD) (SIMD quintiles 1–2) and low deprivation (LD) (SIMD quintiles 3–5) groups for comparison. Rural and urban settings were identified using the Scottish Government Urban-Rural classification based on home postcodes (Scottish Government, 2013). Rural (R) was defined as accessible and remote settlements of less than 10,000 people and urban (U) as settlements over 10,000 people. Ten focus groups and four interviews were conducted across the North East of Scotland and two in West Central Scotland.

Several recruitment methods were used. Participants for eight focus groups were recruited through mailing a randomly sampled group of 1500 people across the North East of Scotland. Names and addresses were supplied by a data consultancy company (ADMAR, Aberdeen, Scotland). Two groups were recruited via email and adverts placed on electronic notice boards in one public and one private workplace in the North East of Scotland. The final two groups were recruited in Glasgow, West Central Scotland, through a community learning centre and a housing association group. All potential participants were sent a letter of invitation with an information sheet describing what the study involved and a short social-demographic questionnaire (i.e. age, sex, employment status, educational attainment, household composition) to be returned by those who wished to participate. In the letter of invitation the purpose of the study was described as wanting to find out people's views about the food that we choose to eat and the impact these choices can have on health and the environment/planet.

Sixty eight people responded positively to the mailing, of which 52 people were able to attend one of the focus groups or an individual interview. An additional 35 participants were recruited from across two worksites and two community centres, but due to the non-personalised recruitment methods used it was not possible to assess a response rate. A total of 87 participants took part in the study and they were all over the age of 25 yrs with a range of educational attainments, employment status and household composition (Table 1). All the groups, except one, were mixed sex and only one participant in the study was vegetarian.

Table 1
Description of the focus group participants.

	n (%)
Age groups	
25–40 yrs	17 (19.5%)
41–55 yrs	26 (29.9%)
>56 yrs	44 (50.6%)
Men	40 (46.0%)
Educational qualifications^a	
No formal qualifications	20 (23.0%)
Secondary school qualifications	16 (18.3%)
Vocational qualification	13 (14.9%)
Degree	35 (40.2%)
Number of people in the household^a	
1	32 (36.8%)
2	31 (35.6%)
3	10 (11.5%)
4	13 (14.9%)
Employment status^a	
Paid employment	46 (52.9%)
Unemployed	13 (14.9%)
Not working	4 (4.6%)
Retired	21 (24.1%)
Meat consumption	
Meat eaters	83 (96.5%)
Ex-vegetarian	3 (3.4%)
Vegetarian	1 (1.1%)
Setting	
Rural	26 (29.9%)
Urban	61 (70.1%)
Deprivation^a	
High (SIMD 1–2)	45 (50.5%)
Low (SIMD 3–5)	40 (47.1%)

^a These categories did not all total 87 due to missing data.

2.2. Focus groups and interviews

The study was conducted using the principles and techniques found in Grounded Theory approaches (Strauss & Corbin, 1998). A topic guide was developed and used to steer the discussion, and enable inductive and deductive reasoning to generate and analyse the data. First, the views and perceptions about climate change were explored and awareness of the environmental impact of food. Discussions then focused on meat consumption and climate change, and concluded by exploring the participants' willingness to eat less meat for environmental benefits. After an unprompted discussion about environment, climate change and food, participants were asked for their views on two statements and whether they agreed or disagreed with them, first, “some people think what we eat is contributing to climate change” and second “some people think that eating less meat would be good for the environment”. Following the discussion of these statements they were asked “would you be willing to reduce the amount of meat you eat for the sake of the environment?”.

Focus groups were held either at public venues in the local community or at the worksite of the participants. All participants gave written informed consent prior to the study. Two researchers, trained in qualitative methods, were present at every focus group (one acted as a facilitator (JIM or FD) and the other a scribe (JC)) and with permission of all the participants the focus groups were digitally recorded (group discussions lasted between 50 and 100 min). Field notes taken by the scribe were discussed with the facilitator after each focus group. One face-to-face interview and

three telephone interviews were carried out and recorded. Audio recordings were transcribed verbatim, checked for accuracy and anonymised.

2.3. Data analysis

Data were analysed thematically to identify dominant and re-occurring themes emerging from the data (Ritchie & Lewis, 2003). Initially a sample of focus group transcripts were read and re-read independently by the two lead researchers (JM, FD) to identify key concepts and themes, from which a draft coding frame was developed. The researchers discussed their initial analysis and interpretation of the themes. Where areas of difference were identified a consensus was reached through further discussion, and then the final version of thematic index was agreed. All the transcripts were coded into the themes, and any new themes were added and discussed. Every attempt was made to search for disconfirming data within the dataset, to include dominant and marginalised viewpoints. Framework analysis was used to explore attitudes towards reducing meat consumption by deprivation, sex or rural/urban setting (Ritchie & Lewis, 2003). Anonymised quotes from the focus groups are used to illustrate the emerging themes, but characteristics of the participant, including sex (M = man, W = woman), level of deprivation (LD = low deprivation, HD = high deprivation) location (U = urban, R = rural) are given with each quote.

Ethical approval for this study was received from the Rowett Human Studies Ethical Review Panel at the University of Aberdeen.

3. Results

There was animated debate throughout many of the discussions, with a range of perspectives voiced within groups, reflecting the diverse range of people who took part in the study. Participants were happy in most cases to challenge the views of fellow discussants if they held a different view on an issue, and conflicting opinions did emerge. The majority of participants believed climate change was real. Many made reference to recent extreme weather events in the UK, but there were divergent views on whether climate change was anthropogenic. Some participants, however, were unaware or had not previously thought of food having an environmental impact or that it was contributing to climate change. Three dominant themes specific to meat consumption emerged from the analysis; 1. lack of awareness of the association between meat consumption and climate change, 2. perceptions of personal meat consumption playing a minimal role in a global context of climate change, and 3. resistance to the idea of reducing personal meat consumption.

3.1. Lack of awareness of the association between meat consumption and climate change

The environmental impact of meat production or its contribution to climate change was rarely spontaneously mentioned, but links were made between red meat and health, as illustrated by one man.

“too much red meat, yes, I think has probably been out, we probably all known that well for several years now [related to health], but I've never actually linked it to an environmental issue.” (M, LD, U)

Discussants typically described food packaging (e.g. plastics, recycling), food waste (e.g. sell by dates, promotions, household waste), transportation of food (e.g. food miles, imported food, local food, seasonality) and production and processing of food (e.g.

agricultural and retail practices, factory pollution) in relation to the environmental impact of food. There was mixed response to the statement “*some people think that eating less meat would be good for the environment*”. While some agreed with the statement, more commonly it was a controversial statement and triggered lively discussions. In one group it produced an emotive response evident by body language where participants strongly disagreed with the statement. Those who agreed with the statement were inclined to associate eating meat with deforestation and methane produced by cattle, others believed that the increased global demand for meat was the problem, which was being driven by economic development and population growth in developing countries. Some of those who disagreed expressed scepticism about the scientific evidence or were simply unconvinced by the argument, as illustrated by one woman, “*Because I dunnae [don't] see where their arguments is coming from [eating less meat]. Nobody's convinced me otherwise*” (W, HD, U). Others believed that compared with other behaviours meat consumption was trivial or that regardless of the impact meat was an essential component of our diet, for health reasons and tradition. A few participants had not considered the link between food/meat and the environment before coming to the group and said that they would want more evidence before they would accept the statement.

“If someone said meat is poor for the environment I would ask for a heck of a lot of information and material to convince me that that is a big issues, certainly compared to the rest of things in the world.” (M, LD, R)

Some people did not believe the association had been proven, as described by one woman, “*... they talk about this cows and that I don't know, I mean that's a fairly new theory isn't it and I don't know whether it's been proven or how much it affects the environment*.” (W, LD, U). Others dismissed the idea because they distrusted most dietary advice because in their opinion it was constantly changing, and so they no longer listened to any advice about what they should or should not eat. They applied this reasoning to the argument about the environmental impact of eating less meat.

“... but then a couple of years later they turn around and say it is good for you, so they're talking gooblygook.” (M, HD, U)

3.2. Perceptions of personal meat consumption playing a minimal role in a global context

It was viewed by some that personally eating less meat would make very little difference to climate change mitigation. Within this theme two sub-themes emerged; *i.* personally unable to make a difference (*me vs. others*), and *ii.* bigger environmental issues (*it's bigger than food*).

i. Me vs. others. Many participants believed that changing their own dietary habits would make very little difference to climate change, especially if others did not change too. This was given as a reason not to eat less meat.

“no, you know, you say well does not having a steak today help because it takes thousands of other people to do the same thing and how do you convince them? No I don't think I would change either, it's selfish but ...” (M, LD, U)

Others spoke about the increasing consumption of meat in developing countries and how this would counteract any reduction in meat consumption made here in the UK. Another view was that controlling global population growth would mitigate problems associated with climate change, which would mean individuals

would not need reduce meat consumption.

“it's all to do with the population as well, in certain countries like India and obviously China, as well and they're having an impact.” (M, HD, U)

Some participants described feeling powerless to reduce the environmental impact through their own dietary choices because decisions about their food supply were controlled by large retailers and business, over which they felt they had very little control. A strong sense of distrust of large supermarket chains emerged. Some described supermarkets as only selling imported products when the same items were produced locally and seasonally. Local independent food stores on the other hand (e.g. butchers, fruit shops) were often viewed as preferable and more trustworthy. Some of this distrust of supermarkets was linked to the ‘horsemeat scandal’ in the UK that occurred during the time of the study (BBC, 2013).

“I think it's quite difficult because I do most of my shopping at the supermarket so even if it is seasonal it doesn't necessarily mean that it is local, you know, it might be something that could be grown locally but actually it's from another country.” (M, LD, U)

ii. It's bigger than food. Other human activities such as transportation (e.g. cars, planes), pollution from industry and power stations in other countries (e.g. China, India, America) and land clearance by non-food industries were often regarded as more environmentally damaging than food production or eating meat. The belief among some people that the contribution of food was relatively trivial was described by one of the participants, “*I think they should concentrate on far bigger things for the environment [coal fired power plants in other countries] than making people feel guilty about eating a steak now and again*.” (M, LD, R). Aspirations of people living in developing countries to eat meat and their changing lifestyles were linked to and described by a few as contributing to the problems of climate change.

281–284, “...they're [developing countries] going to want cars and fridges and microwaves, just the same as we are in a few decades time and I'm frightened for my grandchildren.” (M, LD, U)

3.3. Resistance to the idea of eating less meat

The term *meat* was not defined by the researchers to allow for participants own interpretation. Multiple definitions emerged but it was most commonly defined as either beef and lamb, or red meat, and therefore some considered replacing their meat with chicken. Other definitions of meat included only ‘*real*’ meat (excludes burgers, sausages etc.) or all types of meats. The most striking feature, however, was the resistance to the idea of reducing personal meat consumption. This finding emerged across all socio-economic groups, and there did not appear to be obvious differences in the responses by sex or location (i.e. rural or urban) of the participants. Of those who gave a definitive response (i.e. yes or no) to the question ‘*would you be willing to reduce the amount of meat you eat?*’ most commonly participants indicated that they would not reduce their consumption. Reluctance to reduce meat consumption persisted as a dominant theme throughout the discussions despite awareness of the potential environmental consequences; “I am aware that ruminants cause a problem with methane, that wouldn't stop me eating meat.” (M, LD, R). Other non-food pro-environmental changes were described as preferable to eating less meat, as described by another man.

"I probably won't eat less meat. I'm aware of the environment I take other steps, fine I do my bit, recycling, driving less but I probably wouldn't change my diet." (M, HD, R)

Three sub-themes emerged in the accounts of why people were not willing to eat less meat.

i. *Meat is pleasurable, social and traditional.* Participants commonly described the pleasure they experienced from eating meat, for example "*It's nothing to do with [disliking] the vegetables, I just like meat.*" (M, HD, R). The importance of the perceived tradition and role of meat in the diet (e.g. a *proper* meal has to include meat, it is part of a healthy diet, meat *fills you up*), belief that human beings should eat meat (e.g. man has always eaten meat, it is part of our *staple* diet) and the influence of external social pressures (e.g. others in the household unwilling to eat less meat, not wanting to be seen as different from peers) were described.

"it's not just me that's eating meat in my house. My husband's a bit of a 'it's not a meal unless it has meat in it'." (W, LD, U)

For many, the values held by participants around eating meat outweighed any potential environmental gains. Meat was viewed as having an important role on special occasions, for example eating steak when out for a meal. One participant described how when he went out *trying to force himself* to like vegetarian food and feeling 'virtuous' if he chose a vegetarian meal (M, LD, U).

ii. *Only eat small quantities of meat.* Some participants claimed that they only ate small quantities of meat and therefore didn't need to reduce their consumption. More often this referred to reducing red meat rather than all types of meat, particularly described by the women in these groups.

"I think we eat the right amount, as well, we don't over indulge, we don't have meat every night or whatever, but when we do have it it's good, local, locally sourced as much as possible, but I wouldn't like to eat any less." (W, LD, R)

iii. *Already reduced meat consumption.* Those who claimed to have already reduced their meat intakes (particularly red meat) believed that they did not need to reduce it further. Reasons given for cutting down meat included health concerns, food scares (e.g. CJD, horse meat scandal), the high cost of meat, living with a partner who was vegetarian or changing dietary habits with ageing. These were views expressed by both men and women and across all socio-economic groups.

The minority who said that they would consider eating less meat were more inclined to do this for health benefits rather than environmental gains or would only be willing if there was evidence to support it would be beneficial. One woman (W, HD, U) claimed "*I'd eat less but they'd have to prove to me that it was going to make a difference.*"

Some of those who thought they might be persuaded to cut down their meat consumption said that they would not know what to replace it with, which was seen as a potential barrier.

4. Discussion

This study found that there was a lack of awareness of the association between meat consumption and climate change among the participants, but even when presented with this concept there was a general resistance to the idea of reducing meat consumption. From the group discussions it emerged that meat still plays a significant and important place in the diet of many people, and is associated with pleasure as well as various personal and social

values, which presented potential barriers to reducing consumption. While there is evidence for reducing meat consumption for environmental gains and for some potential health benefits, public perceptions and the acceptability of eating less meat is missing from global scientific and political debates on sustainable diets. A lack of inclusion of social aspects of eating when considering dietary recommendations is not a new phenomenon (Fischler, 2011). One of the very few exceptions to this is in the recently published dietary guidelines for the Brazilian population, which includes some social and cultural aspects of eating (Ministry of Health, 2014).

Despite a lack of awareness about the link between meat consumption and climate change in this study population, even when presented with an evidence based argument the majority of participants were not persuaded to change their dietary habits or intentions. A lack of awareness and underestimation of the relationship between meat and climate change has been reported in other populations in a number of different countries (Vanhonacker, Van Loo, Gellynck, & Verbeke, 2013; Lea & Worsley, 2003; Tobler, Visschers, & Siegrist, 2011; Truelove & Parks, 2012; Bailey, Froggatt, & Wellesley, 2014). A survey of college students in the US, for example, found that less than 10% of respondents associated meat with climate change (Truelove & Parks, 2012). An Australian study reported that 22% of respondents believed eating less meat would have environmental benefits, compared to 90% who believed reducing food packaging would be beneficial (Lea & Worsley, 2008). Evidence of the environmental impact of these behaviours is in direct contrast to many commonly held beliefs. Hoolohan, Berners-Lee, McKinstry-West, and Hewitt (2013) estimated that eliminating packaging, air freighted food and food waste from the food system would reduce GHG emissions by 12%, 5% and 3%, respectively, compared with 35% reduction by eliminating meat from the diet. While this highlights a need to raise awareness, it would be naive to assume this alone will change dietary habits. Previous research describes a moral disengagement around meat, with participants recognising a personal responsibility for health, environment and animal welfare but having no desire to change their meat consumption (Graça et al. 2014). In the present study, some people were not willing to change their meat consumption habits because they were sceptical of the scientific evidence and disengaged as they viewed dietary advice was constantly changing. The perceptions that dietary advice is constantly changing can be exacerbated by reports in the media (Regan et al. 2014). Others held the beliefs that the impact of dietary changes would be insignificant compared to other non-food related behaviours (e.g. transportation) and that personally reducing their meat would make very little difference to global climate change mitigation.

The general reluctance to reduce consumption of meat was perhaps not unexpected given the role meat plays in the diet in many cultures, and therefore it is argued that a step-by-step approach is needed for sustained dietary change (de Boer, Schöslér, & Aiking, 2014; Joyce, Dixon, Comfort, & Hallett, 2012). Arguments to reduce meat consumption, particularly in countries with high intakes, are based on limiting environmental damage and the potential health benefits, but eating less meat is typically viewed as undesirable from the perspective of many of the general public. This is similar to the types of paradox seen in the nutrition transition, where with economic development the shift to diets high in animal products, sugar, fat and processed foods is regarded negatively by health and the environmental experts, but culturally it is highly viewed as desirable and pleasurable (Popkin, 2006). Increasing national income tends to be associated with higher meat consumption but evidence is emerging that this relationship is an inverse U-shape relationship, that is, once national income (GDP/

capita) reaches a certain level meat consumption stabilizes and slowly starts to decrease. Vranken et al. (2014) describes this as the second nutrition transition, but as the authors warn this observed trend should not deter action urgently needed in many countries to accelerate the reduction in meat consumption. Scientific and policy communities are however challenged with multiple dilemmas around reducing meat consumption (as alluded to in the focus group discussions); i. meat provides essential nutrients, but in excess, certain types of meat can increase the risk of negative health outcomes, ii. eating meat elicits pleasure, identity, status and tradition but its high consumption is environmentally unsustainable, and iii. global demand for meat supports industry and the economy, but increasing production is environmentally damaging.

It is important to understand the challenges of changing dietary habits. The knowledge of public reluctance to reduce meat consumption needs to be integrated into the debate along side the objective environmental and health goals in order for more sustainable dietary patterns to emerge. Fischler (2011) describes how the medical discipline of nutrition tends to overlook the importance of the social aspects of eating, and we would argue that there is a danger that this could occur in tackling dietary change to limit environmental damage. Rozin (2005) describes food as a *social vehicle*, which serves functions beyond nutrition. To emerge from this study were some, but certainly not all, of the potential socio-cultural barriers to reducing meat consumption. Pleasure, status, habit, social pressures and social norms are powerful determinants of eating behaviours and have been associated with eating meat (Elliot, 2014; Stead, McDermott, Mackintosh, & Adamson, 2011; Bisogni, Jastran, Seligson, & Thompson, 2012). Piazza et al. (2015) recently described the common rationalizations people use to defend their choice to eat meat as the 4 Ns (natural, normal, necessary and nice). A study of adults in Australia reported that some participants would worry about being viewed as 'wimpy' or 'strange' if they don't eat meat (Lea & Worsley, 2003). Eating meat is the dominant and normalised dietary habit in many developed countries (i.e. only 2–3% of the population in the UK are vegetarian (Bates et al. 2014)) and therefore encouraging dietary change will be difficult to achieve without shifting social norms. Gender issues around meat consumption are described in the literature (e.g. men, meat and masculinity) (Ruby & Heine, 2011; Sobal, 2005; Schösler et al. 2015), but in this study the general responses to reducing meat consumption did not appear to differ between men and women. Some women claimed it would be problematic to reduce their meat intake because their husband/partner would not accept meals without meat as they believed that a proper meal needed to include meat. Conversely, some men claimed to have reduced their consumption of meat because their partner was vegetarian or ate very little meat. In a recent narrative Fischler (2011) describes the important in human society of commensality, that is eating together, which on one hand provides social bonding, but on the other can restrict personal dietary changes. The lack of difference observed across socio-economic groups with regards willingness to reduce consumption of meat in this study highlights that this a population wide issue.

Given the methodology used in this study caution is needed in extrapolating these findings to a wider population. This study, however, elicited views from a wide variety of people from a range of the socio-economic groups, from rural and urban settings, different age groups and different geographic areas in Scotland. The proportion of the sample reporting to be vegetarian in the study was consistent with that in the UK population (Bates et al. 2014). The findings adds to previous research suggesting issues around meat consumption are likely to be common in many populations where meat plays a dominant role in dietary habits. Views about eating less meat did not appear to be influenced by prior discussion

of the negative environmental consequences, which may have been expected since expressing a reluctance to reducing meat consumption could be viewed as a socially undesirable response. Focus group discussions can often be dominated by a few participants, with fellow participants following the lead which can result in a consensus view. However within many of the group discussions in this study there were divergent views and at times heated debate between participants on some of the issues. It is possible that the reaction to the concept of eating less meat could have been influenced by people interpreting the statement as coming from organisations with authoritative guidance (e.g. government), which in turn could have stimulated a negative reaction. One further issue that should be born in mind is that the amount of meat consumed by participants was not assessed during this study and therefore the quantity of meat eaten by those who claimed to only eat small amounts or had reduced their intake was unknown.

5. Conclusion

This study has found evidence that public opinion around eating meat is still associated with important personal, social and cultural values, suggesting that individual dietary change will be difficult to achieve without addressing these values and beliefs. To date improving dietary habits in line with dietary recommendations has proved extremely difficult. Integrating social dimensions of dietary habits with the objective health, environmental and economic goals provides an opportunity to develop more realistic policy interventions that reflect the complex, subjective lived experiences of individuals and society. Messaging around sustainable diets to eat less meat may be met with resistance among the general public and given a degree of scepticism around dietary messages a staged approach may be more effective in changing dietary habits in the long term.

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References

- 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.
- Bailey, R., Froggatt, A., & Wellesley, (2014). *Livestock – climate change's forgotten sector: Global public opinion on meat and dairy consumption Chatham house report*. The Royal Institute of International Affairs.
- Bajzelj, B., Richards, K. S., Allwood, J. M., Smith, P., Dennis, J. S., Curmi, E., et al. (2014). Importance of food-demand management for climate mitigation. *Nature Climate Change*, 4, 924–929.
- Bates, B., Lennox, A., Prentice, A., Bates, C., Page, P., Nicholson, S., et al. (2014). *National diet and nutrition survey rolling programme (NDNS RP). Results from years 1–4 (combined) (2008/9–2011/12)*. Public Health England and Food Standards Agency in Scotland.
- BBC News. (18 January 2013). *Why are the British revolted by the idea of horsemeat?*. Internet: <http://www.bbc.co.uk/news/magazine-21043368> Accessed 08.01.15.
- Biesbroek, S., Bueno-de-Mesquita, H. B., Peeters, P. H. M., Verschuren, W. M. M., van der Schouw, Y. T., Kramer, G. F. H., et al. (2014). Reducing our environmental footprint and improving our health: greenhouse gas emission and land use of

- usual diet and mortality in EPIC-NL: a prospective cohort study. *Environmental Health*, 13, 27. <http://dx.doi.org/10.1186/1476-069X-13-27>.
- Bisogni, C. A., Jastran, M., Seligson, M., & Thompson, A. (2012). How people interpret healthy eating: contributions of qualitative research. *Journal of Nutrition Education and Behavior*, 44, 282–301.
- de Boer, J., Schösler, H., & Aiking, H. (2014). "Meatless days" or "less but better"? Exploring strategies to adapt western meat consumption to health and sustainability challenges. *Appetite*, 76, 120–128.
- Carlisle, S., & Hanlon, P. (2014). Connecting food, well-being and environmental sustainability: towards an integrative public health nutrition. *Critical Public Health*, 24(4), 405–417.
- Chun Yip, C. S., Glenis, C., & Karnon, J. (2013). Systematic review of reducing population meat consumption to reduce greenhouse gas emissions and obtain health benefits: effectiveness and models assessments. *International Journal of Public Health*, 58, 683–693.
- Eating Better. (2014). *Let's talk about meat: Changing dietary behaviour for the 21st century*. Internet: <http://www.eating-better.org/blog/23/new-survey-shows-support-for-eating-better-messages.html> Accessed Jan 2015.
- Elliot, C. (2014). Food as people: teenagers' perspectives on food personalities and implications for healthy eating. *Social Science & Medicine*, 121, 85–90.
- Eshel, G., Shepon, A., Makov, T., & Milo, R. (2014). Land, irrigation water, greenhouse gas, and reactive nitrogen burdens of meat, eggs, and dairy production in the United States. *PNAS*, 111, 33.
- FAOSTAT <http://faostat3.fao.org/browse/FB/BL/E> Internet. Accessed 10.12.14.
- FAO. (2006). *Livestock's long shadow*. Rome: Food and Agriculture Organisation.
- FAO. (2010). *Definition of sustainable diets*. International scientific symposium: *Biodiversity and sustainable diets united against hunger*. Rome (Italy): Food and Agriculture Organization of the United Nations.
- Fiddes, N. (1992). *Meat: A natural symbol*. Routledge.
- Fischler, C. (2011). Commensality, society and culture. *Social Science Information*, 50(3–4), 528–548.
- Graça, J., Calheiros, M. M., & Oliveira, A. (2014). Moral disengagement in harmful but cherished food practices? An exportation into the case of meat. *Journal of Agricultural and Environmental Ethics*, 27, 749–765.
- Hedenus, F., Wirsén, S., Daniel, J., & Johansson, A. (2014). The importance of reduced meat and dairy consumption for meeting stringent climate change targets. *Climatic Change*, 124, 79–91.
- Holm, L., & Møhl, M. (2000). The role of meat in everyday food culture: an analysis of an interview study in Copenhagen. *Appetite*, 34, 277–283.
- Hoolohan, C., Berners-Lee, M., McKinstry-West, J., & Hewitt, C. N. (2013). Mitigating the greenhouse gas emissions of food through realistic consumer choices. *Energy Policy*, 63(12), 1065–1074.
- Joyce, A., Dixon, S., Comfort, J., & Hallett, J. (2012). Reducing the environmental impact of dietary choice: perspectives from a behavioural and social change approach. *Journal of Environmental and Public Health*. <http://dx.doi.org/10.1155/2012/978672>.
- Larsson, S. C., & Orsini, N. (2014). Red meat and processed meat consumption and all-cause mortality: a meta-analysis. *American Journal of Epidemiology*, 179(3), 282–289.
- Lea, E., & Worsley, A. (2003). Benefits and barriers to the consumption of a vegetarian diet in Australia. *Public Health Nutrition*, 6(5), 505–511.
- Lea, E., & Worsley, A. (2008). Australian consumers' food-related environmental beliefs and behaviours. *Appetite*, 50(2–3), 207–214.
- Leroy, F., & Praet, I. (2015). Meat traditions. The co-evolution of humans and meat. *Appetite*, 90, 200–211.
- Macdiarmid, J. I., Kyle, J., Horgan, G. W., Loe, J., Fyfe, C., Johnstone, A., et al. (2012). Sustainable diets for the future: can we contribute to reducing greenhouse gas emissions by eating a healthy diet? *American Journal of Clinical Nutrition*, 96, 632–639.
- Micha, R., Wallace, S. K., & Mozaffarian, D. (2010). Red and processed meat consumption and risk of incident coronary heart disease, stroke, and diabetes mellitus: a systematic review and meta-analysis. *Circulation*, 121(21), 2271–2283.
- Ministry of Health Brazil. (2014). *Dietary guidelines for the Brazilian population*. ISBN: 978-85-334-2176-9.
- Pan, A., Sun, Q., Bernstein, A. M., Schulze, M. B., Manson, J. E., Willett, W. C., et al. (2011). Red meat consumption and risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis. *American Journal of Clinical Nutrition*, 94, 1088–1096.
- Piazza, J., Ruby, M. B., Loughnan, S., Luong, M., Kulik, J., Watkins, H. M., et al. (2015). Rationalizing meat consumption. The 4Ns. *Appetite*, 91, 114–128.
- Popkin, B. M. (2006). Global nutrition dynamics: the world is shifting rapidly toward a diet linked with non-communicable diseases. *American Journal of Clinical Nutrition*, 84, 289–298.
- Regan, Á., McConnon, Á., Kuttischreuter, M., Rutsaert, P., Shan, L., Pieniak, Z., et al. (2014). *The impact of communicating conflicting risk and benefit messages: An experimental study on red meat information food quality and preference*, 38 pp. 107–114.
- Richardson, N. J. (1994). UK consumer perceptions of meat. *Proceedings of the Nutrition Society*, 53, 281–287.
- Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: A guide for social science students and researchers* (1st ed.). SAGE Publications Ltd.
- Rockstrom, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., Lambin, E., et al. (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society*, 14(2), 32.
- Rozin, P. (2005). The meaning of food in our lives: a cross-cultural perspective on eating and well-being. *Journal of Nutrition Education and Behavior*, 37, S107–S112.
- Ruby, M. B., & Heine, S. J. (2011). Meat, morals, and masculinity. *Appetite*, 56, 447–450.
- Schösler, H., de Boer, J., Boersema, J. J., & Aiking, H. (2015). Meat and masculinity among young Chinese, Turkish and Dutch adults in the Netherlands. *Appetite*, 89, 152–159.
- Scottish Government. (2009). *Scottish index of multiple deprivation 2009: General report*. Edinburgh: Scottish Government. Internet: <http://www.scotland.gov.uk/Publications/2009/10/28104046/0> Accessed 08.01.15.
- Scottish Government. (2013). *Urban rural classification*. Internet <http://www.scotland.gov.uk/Topics/Statistics/About/Methodology/UrbanRuralClassification> rural urban Accessed 08.01.15.
- Smil, V. (2002). Eating meat: evolution, patterns, and consequences. *Population and Development Review*, 28(4), 599–639.
- Sobal, J. (2005). Men, meat, and marriage: models of masculinity. *Food & Foodways*, 13, 135–158.
- Soret, S., Mejia, A., Batech, M., Jaceldo-Siegl, K., Harwatt, H., & Sabaté, J. (2014). Climate change mitigation and health effects of varied dietary patterns in real-life settings throughout North America. *American Journal of Clinical Nutrition*, 100(Suppl. 1), 490S–495S.
- Stead, M., McDermott, L., Mackintosh, A. M., & Adamson, A. (2011). Why healthy eating is bad for young people's health: identity, belonging and food. *Social Science & Medicine*, 72(7), 1131–1139.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks: Sage.
- Tobler, C., Visschers, V. H. M., & Siegrist, M. (2011). Eating green. Consumers' willingness to adopt ecological food consumption behaviours. *Appetite*, 57, 674–682.
- Truelove, H. B., & Parks, C. D. (2012). Perceptions of behaviors that cause and mitigate global warming and intention to perform these behaviors. *Journal of Environmental Psychology*, 32(3), 246–259.
- US Department Health and Human Services. (2015). *Scientific report of the 2015 dietary guidelines advisory committee*. <http://www.health.gov/dietaryguidelines/2015-scientific-report/> Accessed 18.02.15.
- Vanhonacker, F., Van Loo, E. J., Gellynck, X., & Verbeke, W. (2013). Flemish consumer attitudes towards more sustainable food choices. *Appetite*, 62, 7–16.
- Vranken, L., Avermaete, T., Petalios, D., & Mathijs, E. (2014). Curbing global meat consumption: emerging evidence of a second nutrition transition. *Environ Science Policy*, 39, 95–106.
- Winkler, J. T. (2013). Brutal pragmatism on food. *BMJ*, 346, f3728.