

PUBLIC UNDERSTANDING OF SUSTAINABLE DIETS AND CHANGES TOWARDS SUSTAINABILITY: A QUALITATIVE STUDY IN A UK POPULATION SAMPLE

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ABSTRACT

Dietary consumption contributes significantly to the environmental impacts of daily life. Changes to consumption are required, but limited work investigates the reasoning underlying relevant dietary choices. This study aimed to explore public understanding of sustainable diets and any willingness or attempts to make changes towards sustainability in a sample of the UK population. A qualitative approach was used. Twenty-one participants (10 males; predominantly young adults; with a range of living circumstances and cooking responsibilities) were interviewed. Interviews were analysed using inductive thematic analysis. Four themes were identified that related to understanding sustainable diets: 'Consistent with the definition by the FAO', 'Multiple benefits', 'Unsure' and 'Competing Interests'. Four themes related to making changes: 'Willing, but unsure', 'Small easy changes', 'Enablers' and 'Barriers'. An additional theme 'COVID-19 pandemic' reflected the period when the work was done (February – May, 2021). Within these themes, participants were able to define sustainable eating in a manner that was consistent with and incorporated aspects of the definition by the FAO, could identify sustainable actions that they were undertaking or could undertake, and considered these to be beneficial, but there was a lot of uncertainty, and alternative or competing definitions and actions were also given. Participants were also willing to make changes to make their diet more sustainable, and preferences were expressed for small easy changes of high impact, but

there was again considerable uncertainty as to what changes to make. Caution due to the small and select sample is required, but suggestions from this work include increasing awareness and knowledge of the environmental impacts of dietary choices, focusing on small easy changes of likely impact and personal benefit, and increasing availability and accessibility to sustainable diets.

Keywords:

Sustainability; environmentally-friendly; dietary intakes; awareness; knowledge; qualitative; thematic analysis

1. INTRODUCTION

Defined as “*diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations*” (Food and Agriculture Organisation of the United Nations (FAO), 2010, p.9), sustainable diets have the potential to contribute to planetary health and global food security, while also promoting population health (Berry, Dernini, Burlingame, Meybeck & Conforti, 2015; Binns, Lee, Maycock, Torheim & Nanishi, 2021; Clark, Hill & Tilman, 2018; Joyce, Dixon, Comfort & Hallett, 2012; Macdiarmid, 2013). “*Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimising natural and human resources*” (Food and Agriculture Organisation of the United Nations (FAO), 2010, p.9). With a focus on the environment, currently, 20-30% of environmental impacts from daily life in Europe and the UK are thought to derive from dietary intakes, to include impacts from food production, processing, transport and retail (Joyce, et al., 2012; Hoolohan, Berners-Lee, McKinstry-West & Hewitt, 2013; Tukker, Goldbohm, de Koning, et al., 2011; Tukker & Jansen, 2006). Modelling studies further suggest that these impacts can be reduced through changes to dietary consumption (e.g. Berners-Lee, Hoolohan, Cammack & Hewitt, 2012; Castañé & Antón, 2017; Chai, van der Voort, Grofelnik, Eliasdottir, Kloss & Perez-Cueto, 2019; Hoolohan, et al., 2013; Macdiarmid, 2013). Certain foods, such as meat and animal products, are known to contribute more to environmental impacts than others (Tukker, et al., 2011; Tukker & Jansen, 2006), and diets that include these foods are reported to have higher environmental impacts than those that are mainly plant-based (Berners-Lee, et al., 2012; Castañé & Antón, 2017; Chai, et al., 2019; Hoolohan, et al., 2013; Hyland, McCarthy, Henchion & McCarthy, 2017; Joyce, et al., 2012; Macdiarmid, 2013; Scarborough, Appleby, Mizdrak, et al., 2014). Meat and animal products can also contribute disproportionately to unhealthy dietary profiles, as a result of higher intakes of animal fats and salt (Castañé & Antón, 2017; Chai, et al., 2019; Joyce, et al., 2012; Macdiarmid, 2013).

Changing dietary consumption however, may be a challenge (Joyce, Hallett, Hannelly & Carey, 2014; Macdiarmid, 2013). Firstly, consumers seem largely unaware of the environmental impact of dietary consumption. Studies on lifestyle suggest that dietary intakes are considered to contribute little to overall environmental footprints, thus individuals may be unlikely to consider changing their diet as an important environmental behaviour (Hartmann & Siegrist, 2017; Truelove & Parks, 2012; Vanhonacker, Loo, Gellynck & Verbeke, 2013).

Second, the definition of a sustainable diet is complex and multi-faceted (Macdiarmid, 2013), and this complexity may be confusing and detrimental to implementation. Studies on specific sustainable actions, e.g. reducing meat consumption, suggest some willingness but also some resistance to change from consumers (Hartmann & Siegrist, 2017; Lea & Worsley, 2008; Tobler, Visschers & Siegrist, 2011; Vanhonacker, et al., 2013). Willingness to change in some consumers and resistance in others is also reported (Hartmann & Siegrist, 2017; Tobler, et al., 2011; Vanhonacker, et al., 2013), as is the suggestion that some actions may be more acceptable than others (Hartmann & Siegrist 2017; Lea & Worsley, 2008; Tobler, et al., 2011; Vanhonacker, et al., 2013). While demonstrating these effects, however, the above studies have tended not to investigate the underlying reasoning that elicits these effects, and this reasoning may be key to understanding how best to motivate change. Limited qualitative studies have investigated some of the reasoning underlying specific actions (Hoek, Pearson, James, Lawrence & Friel, 2017; Macdiarmid, Douglas & Campbell, 2016; Mann, Thornton, Crawford & Ball, 2018), to reiterate the findings from questionnaire studies and to provide added insight into these specific actions. Further work to understand the ideas and actions generated by individuals themselves and the reasons for undertaking these, would add to this insight.

This study aimed to explore public understanding of sustainable diets and any willingness or attempts to make changes towards sustainability in a sample of the UK population. This was an

exploratory study aiming to understand existing knowledge, reasoning and behaviours in an open manner; there were no hypotheses to be tested.

2. METHODS

2.1. Participants

Participants were required to be aged 18 years or over, identify as British, be able to provide informed consent and undertake all aspects of the study. Limited additional inclusion criteria were used to gain a wide variety of opinions from a variety of participants, to include participants from both genders, with a range of ages, living circumstances, cooking responsibilities and dietary choices. Recruitment focussed on young adults, as a population group who may be more amenable to dietary change, and where benefits may accrue over the long-term (Nelson, Story, Larson, Neumark-Sztainer & Lytle, 2008). Recruitment was undertaken over the Dorset area in the UK using social media, local public advertisements and word-of mouth, for a '*Study into Current Diets*'. The study was given ethical approval by the Research Ethics Committee of Bournemouth University, UK prior to commencement (ID: 34632), and all participants provided written informed consent.

2.2. Data collection

A qualitative approach was taken, using solo interviews. Interviews were considered an appropriate methodology to gain detailed, rich and personal responses from participants (Braun & Clarke, 2013), and was considered a practical method at the time the research was conducted. Each interview started with explanation of the study and study procedures, and confirmation of consent. Next, questions on current diet were asked, to establish rapport and familiarise participants with the interview process. Following this, participants were queried on their understanding of sustainable diets, and any willingness or attempts to make changes towards increased sustainability. Questions on understanding centred around the definition of a sustainable diet, what this may entail, and the possible impacts of this. Questions on making changes focussed on willingness to make changes,

possible enablers and barriers to sustainable dietary consumption, and then what may facilitate change towards increasing sustainability. Interviews followed an interview schedule, piloted prior to use, with some additional prompts added following piloting. The interview schedule is provided in the Supplementary Materials. All questions were open and broad to elicit a range of responses, and were asked in an open, accepting and non-judgemental manner (Braun & Clarke, 2013). Interviews were conducted and recorded over Zoom, then transcribed, from February – May, 2021, during the COVID-19 pandemic, when restrictions on activities were in place across the UK.

2.3. Data Analysis

The analysis plan was pre-specified in advance of data collection. Interview transcripts were analysed using thematic analysis, following the six steps of Braun & Clarke (2006): 1) read and familiarise self with the script; 2) identify initial codes within the data; 3) collate codes and identify possible themes; 4) review and check if themes fit across all data sets and create a thematic map of the analysis to address the main topics identified; 5) define and name themes; 6) present results. Thematic analysis was considered suitable considering the topic of the interviews as non-sensitive and a topic that participants were willing to discuss openly (Braun & Clarke, 2006). All interviews and transcripts were completed by one researcher (BW). All transcripts were read and coded by two researchers independently (BW and SW or KMA), and all codes were subsequently agreed. All codes were data-derived; no pre-specified coding or theoretical framework was applied, to encourage the use of unconstrained codes (Thomas, 2006). The agreement between coders was 94%. Interviews and analyses were undertaken alternately to allow an assessment of the number of new codes arising per interview. Interviews were stopped when no new codes were found in two consecutive analysed transcripts as a marker of data saturation (Guest, Namey & Chen, 2020). Once all codes were confirmed, codes were then discussed by all three researchers and collated based on underlying topic to result in themes (Braun & Clarke, 2013). Transcripts were typed, but no specific software was used during analysis, the researchers preferring handwritten notes and 'post-it' notes.

Finally, an independent researcher (DJG) confirmed all themes and included codes, as an aid to internal validity (Malterud, 2001). No disagreements were found. This researcher also checked and confirmed the reporting of all themes as provided here.

2.4. Researchers and Reflexivity

All four researchers were female. Two researchers have a background in Health Psychology, one has a background in diet and nutrition, and one has a mixture of both. All of the researchers have an interest in and practice healthy eating, and have interests in sustainability. The work was undertaken as a result of the interests of the two main researchers (BW, KMA) with genuine interests in encouraging sustainable eating and in gaining as much useful knowledge in this area as possible. The validity of the work was aided by additional researchers with emerging interests in this specific aspect of sustainability, so reducing potential biases due to prior knowledge, but the backgrounds and interests of all researchers may have influenced the identification and interpretation of the data (Malterud, 2001). All researchers were also aware of a current social desirability bias towards sustainability in the UK, and sought to ensure open and genuine responses from participants and analyses, but social desirability remains a threat in this topic area (Hartmann & Siegrist, 2017; Lea & Worsley, 2008; Tobler, et al., 2011; Vanhonacker, et al., 2013).

3. RESULTS

3.1. Participants

Twenty-one participants took part: 11 females, 10 males. The majority of participants were aged 20-25 years, but four participants were aged 26-35 years and 2 participants were aged 50-55 years. Three participants lived with others and usually cooked for everyone, three participants lived with others and shared the cooking, four participants lived with others and sometimes cooked, five participants lived alone or with others and cooked for themselves, five participants lived with others and were usually cooked for, and one participant lived with others and had recently taken over most

of the cooking for the family. For dietary choices, four participants mentioned an active lifestyle that warranted high intakes, two participants specifically mentioned enjoying cooking and consuming from a variety of cuisines, three participants described their diets as unhealthy, three participants reported dietary restrictions, and six participants specifically reported trying to change their diets to consume more healthy or sustainable foods. Brief characteristics of each participant are given in Table 1, full details are given in the Supplementary Materials Table S1.

Table 1 about here

3.2. Themes

Themes were identified separately in relation to both understanding sustainable diets and making changes towards sustainability. In both areas, these themes suggested some interest in sustainable eating, but also considerable uncertainty and competing concerns. A theme related to the COVID-19 pandemic was also observed, considering the period in which the work was done. A map of the themes is presented in Figure 1. Themes are presented individually below, but there was also a lot of overlap. Example quotes are included; direct quotes are denoted with reference to the contributing participant, quotes that are not directly allocated denote ideas and were provided by multiple participants. A more comprehensive collection of the codes and quotes per theme is given in the Supplementary Materials Table S2.

Figure 1 about here

3.2.1. UNDERSTANDING SUSTAINABLE DIETS

Four themes related to understanding sustainable diets: 'Consistent with the definition by the FAO', 'Multiple benefits', 'Unsure' and 'Competing Interests'. Participants were able to define sustainable eating in a manner that was consistent with and incorporated aspects of the definition by the FAO,

could identify sustainable actions that they were undertaking or could undertake to make their diets more sustainable, and largely considered these to be beneficial, but there was also a lot of uncertainty over definition and actions, and alternative or competing definitions and actions were also given.

3.2.1.1. Consistent with the definition by the FAO

Definitions of sustainable diets that were consistent with and incorporated aspects of the definition by the FAO largely considered plant-based consumption and the balance between meat and plant-based diets, food waste, sources of foods, food transportation and food packaging. Similarly, examples of sustainable actions included consuming less meat, consuming more fruits and vegetables, consuming more seasonal foods, shopping for locally sourced foods or in shops supplied by local suppliers, such as butcher's, fishmonger's and farmer's markets, and reducing food waste. Some extreme examples of these concerns were also provided, e.g. *'consuming a meat-free diet'*, and while various aspects of sustainable eating were often given or implied throughout each interview, no participant provided a definition of sustainable diets that incorporated all of the aspects covered by the FAO.

'I think eating more sustainably would be more fresh and more vegetables and less meat' (Ppt 12, female, lives with others, sometimes cooks)

'I guess buying from this farm place could be quite sustainable as it is local, and comes in cardboard, nothing is ever wrapped too much, and it's local. So I suppose that could be quite sustainable' (Ppt 20, female, lives with others, is usually cooked for)

3.2.1.2. Multiple benefits

Multiple benefits of a sustainable diet were voiced, and there were general suggestions that sustainable diets would be *'a good thing all round'*, that there were no disadvantages, and that many less sustainable practices were largely unnecessary.

'I don't think there is any sort of negative outcomes that can come from a sustainable diet, ... so, in every aspect it's pretty positive' (Ppt 19, male, lives with others, cooks for himself and is cooked for)

Specific benefits were also offered in relation to health, the environment and society, as below. Health benefits included physical health benefits, plus benefits for performance and well-being. Benefits for the environment included reduced greenhouse gas emissions, reduced use of resources, reduced waste, pollution and deforestation, and a reduced need for plastic and packaging. Societal benefits included a reduced drain on communal resources as a result of improved health and well-being, contributions to local communities through supporting farmers and local suppliers, and benefits for animal welfare. Consideration of society did also result in some recognition that what was beneficial for one society may have detrimental effects for others or that some sustainable actions may have negative impacts for some societies, e.g. if those societies were relying on food exports. Some disadvantages to health were also recognised if diets were then lacking in critical nutrients or were not followed with thought.

3.2.1.3. Unsure

While some knowledge on sustainable eating was clear, many participants, however, were also unsure, were unable to provide a definition of a sustainable diet, or were able to provide an aspect of consistency with the definition by the FAO, but were not confident in this. There were a lot of hesitations and delays in responding to the question *'What do you understand by a sustainable diet?'*, alongside a lot of phrases like *'I think'*, *'I reckon'*, *'May be'*, and *'Is it ...?'*

'(I would say a sustainable diet would be stuff that we grow, so foods like potatoes and veg. I think a sustainable diet would be one day you go vegetarian), but I don't really know, I don't really know what a sustainable, sustainable diet would be, if I'm honest'

(Ppt 4, male, lives with others, is mostly cooked for)

Participants were also unsure of the actions they could take, or had some ideas, but weren't confident in these, or simply suggested confusion. Some participants did also recognise their own poor understanding of sustainability; participants mentioned *'needing to find out'* or *'needing help'*; and observed poor understanding in other people.

3.2.1.4. Competing interests

Some confusion also arose where participants provided alternative (non-environment based) definitions of a sustainable diet or knew of actions that they could take, but participants weren't sure of the value of these compared to competing interests or actions. Alternative definitions of sustainability largely referred to diets that could be maintained for a long period of time, were manageable on a regular basis, because they were tolerable in terms of taste, practical issues, such as time and cost, and were considered adequate for health. Participants referred to the UK dietary recommendations, to nutrients and energy, or to balance and moderation. Some participants recognised the existence of alternative (non-environment based) definitions, and in these cases, they were considered to compete, greater emphasis was typically placed on the alternative definition, and there was little consideration that the two definitions were not mutually exclusive. In these situations, the environmental definition appeared to be considered something of a fashion.

'So, sustainable is a bit of a buzzword at the moment, about where your food comes from, but I would probably think a sustainable diet is more a diet that you can see yourself sticking to long-term' (Ppt 7, female, lives with others, sometimes cooks).

3.2.2. MAKING CHANGES TOWARDS SUSTAINABILITY

With regard to making changes, four main themes arose: 'Willing, but unsure', 'Small easy changes', 'Enablers' and 'Barriers'. Participants were willing to make changes to make their diet more sustainable, but they weren't sure what these changes should be. Greater interest was expressed for small changes, and changes that could be implemented with limited cost or effort. Enablers to change also included the taste and pleasure gained from sustainable eating, the availability of sustainable foods, and an element of social responsibility. Barriers to change included concerns over taste, pleasure, cost, availability, time, effort and convenience, habit, a lack of awareness, interest, need and/or knowledge, and concerns over limited impact and competing interests.

3.2.2.1. Willing, but unsure

Participants were willing, and some were keen, to make changes to make their diet more sustainable, but participants were largely unsure what these changes should be or lacked confidence. Comments again suggested considerable uncertainty and hesitation, or the possibility that any actions they undertake may be sustainable from one perspective, but not from another, resulting in confusion. Noticeably, confusion arose where participants knew of actions that they could take, but they weren't sure of the value of these compared to competing interests or actions, or if one action would be counteracted by another:

'I could drive to the supermarket [to have access to a greater range of foods], but then is that sustainable because I will be releasing CO₂ emissions into the atmosphere?' (Ppt 5, male, lives with others, sometimes cooks)

'I think it's so complicated and I've heard so many different things like a vegan diet is good because you're not eating meat so [creating] less methane, but then so many people say that something like tofu might have a higher carbon footprint than something else, so it's extremely complicated' (Ppt 14, female, lives with others, usually cooks)

Part of this confusion was associated with the multiple aspects of sustainability, e.g. in terms of greenhouse gases, carbon storage, water usage, and that one aspect of the definition may be satisfied with certain practices, while other aspects may be worsened, resulting in difficulty in understanding what was actually important. For some participants, this confusion also led to disengagement and inaction; they wanted to do more and were willing to, but they didn't know what they should be doing, and consequently weren't doing anything.

3.2.2.2. Small easy changes

There was a clear interest in small changes; participants were resistant to making large changes to their diets or felt that this would not be possible within their personal circumstances, but they were largely open to making small changes or to change only one or two aspects of their diets. There was a feel of cost-benefit, where people were willing to incur a small cost for some benefit, but only if this cost was small or if this change was easy to implement. There were clear requests to make it easy. Participants were also open to making changes, but they weren't going to hunt these out. References were made to the traffic light system in the UK, that provides an easy indication of ingredient content and so the health impact of foods.

'So I wouldn't pay three times the amount for a meal, but I would pay a little bit more'
(Ppt 8, male, lives with others, cooks for himself).

'I would (like to adopt a more sustainable diet), to clear my conscience, but I would because I think it would make me a better person. But like I said I'm not going to go out my way to do it and make my life difficult' (Ppt 6, male, lives with others, usually cooks for himself)

3.2.2.3. Enablers

Taste and pleasure; Availability: Some factors were reported to enable or facilitate sustainable consumption. Participants mentioned particularly the taste of sustainable options, the pleasure they could gain from cooking and eating sustainable dishes and the well-being they felt from taking care of themselves or *'doing their bit for the planet'*. Many participants mentioned surprise or unexpected pleasure at the taste of sustainable dishes. Participants recognised the importance of pleasure from food consumption, and that this pleasure could facilitate more sustainable consumption if sustainable alternatives conferred pleasure.

'I ate like a vegetable lasagne which I remembered because I expected to really not like it, and it was actually really nice. There was still lots of cheese on it so it wasn't vegan, but it was really nice as well, so it did kind of open my eyes up a bit to eating that way and that just because it's veggie doesn't mean it's going to be grim, it just has to be done right I think' (Ppt 8, male, lives with others, cooks for himself)

Other enablers included the ease with which participants could obtain sustainable foods, the availability of alternatives to less sustainable options, the importance of other aspects of their surroundings, such as those they were living with or cooking for, and some participants recognised the reduced cost of plant-based foods compared to meat.

Social responsibility: Some participants also suggested some moral obligation to making changes. Participants mentioned *'this is what we should be doing'*, and a personal need to *'maybe try harder'*. Some participants recognised that they could do more than they were currently doing or had previously considered doing.

3.2.2.4. Barriers

Taste and pleasure; Cost; Availability; Time, effort and convenience; Habit: Barriers to sustainable eating largely reflected the various barriers often provided towards healthy eating. Concerns over taste and pleasure, or some of the other sensory aspects of foods, seemed largely a fear as opposed to a reality, but participants also mentioned the possibility that a sustainable diet could be restrictive, resulting in tedium or a lack of pleasure; participants provided concerns that they liked eating meat and wouldn't want to lose that pleasure; or that they could grow more vegetables themselves, but they didn't like eating those vegetables. Practical concerns related to the cost and availability of sustainable foods, and the time and effort required to source and prepare sustainable meals. Participants mentioned not having time for cooking from scratch, markets not having long or convenient opening hours; not having time to shop in many different local stores; not having time to grow or care for home-grown vegetables. In relation to availability, there were some suggestions also, that less sustainable options were too easily available, that there were few alternatives available or that the sustainable alternatives that were available were poor substitutes. Circumstances such as living situation were also blamed. Habit was offered as a key barrier; the idea that people were used to eating a diet already, and that they wouldn't want to change this. This idea was also extended to cultural or societal habits, with ideas around demands and expectations for certain foods that were not sustainable for consumption in the UK, but were none-the-less part of the usual diet; items such as bananas, avocados, and tropical fruit. Some participants also suggested an expectation of diet from society or their culture, and suggested likely judgement or stigma if they attempted to consume a diet that was different.

Lack of awareness, interest, need: Other barriers also centred around a lack of awareness, interest, or need for sustainable eating; an idea that '*I am already eating sustainably*', or '*I am already doing enough*'. Some participants were unable to describe whether their current diet was sustainable or not, and appeared not to have considered this. Many participants thought their diet was sustainable to some degree already, that there was no need for them to change, and that they were content with the diet that they already had, for their lifestyle, pocket, tastes, and so on. Some participants recognised that they might be sustainable, but on reflection, that they probably weren't, or weren't acting as sustainably as they could.

Lack of knowledge / information: Participants also mentioned or suggested a lack of knowledge. Dietary knowledge was largely gained from school, from friends and family, particularly while growing up, and from newspaper, online and TV media sources, mainly 'in passing'. Some participants mentioned a personal interest in food for other reasons, or a pleasure from learning about foods, via cooking and sampling new dishes or restaurants, or via experiences with other cultures through travel. For some participants, information had had an effect on their diets, both by increasing and decreasing the consumption of certain foods. However, difficulties with information were also given; there was a distrust of some information sources, due to the possibility of both downplaying or overplaying concerns, questions over reliability, particularly from popular media sources, or an unwillingness to engage with information that was contradictory, shocking or seen to be geared towards a particular agenda. Participants mentioned the need for trustworthy honest information, but also that they wanted this '*easily*'; they didn't want to have to search or find information themselves. Participants suggested that they wanted or needed to know more, but they didn't have the time, inclination or know where to look for it.

Likely impact: Some participants mentioned that clear details on actual impact might also help. Some participants, furthermore, were deterred from action, by the size of the impact they thought that their small actions could have, or seemed unwilling to make changes if they were unsure of the value of them.

'If I knew ... the direct influence that it (sustainable eating) would have. If I knew by buying a sustainable product for a certain amount of years, it would have this amount of impact on the planet or carbon footprint, I think that would help' (Ppt 7, female, lives with others, sometimes cooks)

There was a recognition also that any impact would be greater the more people undertook an action, and for some participants this translated into a need for everyone to be doing something, and a feeling of futility if only I am doing this. Participants were willing to make changes and would like to make a difference, but were not sure what these changes should be for maximum impact.

'I think the problem with the big wide world we live in is that there are so many individuals, if I knew I could have an impact by changing my diet to something more sustainable, then, yeah of course I would, but because there are so many people it will take a big number of people to have an impact. So yeah, if I got consent from the other 8 billion people on the planet' (Ppt 2, male, lives with others, is mostly cooked for).

Competing interests: Participants also mentioned competing interests, or a need to focus on alternative aspects of their diet prior to actioning sustainability. Priorities included healthy diets, restrictive diets, e.g. gluten-free, other features of diet, such convenience or food quality, and diets that were acceptable to all family members. There was recognition also that not everyone could

change their diets, that competing demands such as finances may prevent changes in some, and that those who could change their diets may be in a privileged position.

3.2.3. COVID-19 PANDEMIC

Attitudes towards sustainable eating were largely unaffected by the COVID-19 pandemic and related restrictions, but some changes to dietary behaviours were noted. Participants mentioned food deliveries, including seasonal vegetable boxes, as a result of shopping restrictions, that they considered to be more sustainable than their previous consumption; supermarket deliveries again as a result of shopping restrictions which were less sustainable than in-person visits either to local shops or to supermarkets, where packaging and food provenance could be checked; and increased home cooking. Participants referred to recipes and cooking as part of a sustainable diet. Many participants hoped to continue the sustainable activities that had been adopted during the pandemic, once restrictions relaxed.

4. DISCUSSION

This work aimed to explore public understanding of sustainable diets and any willingness or attempts to make changes towards sustainability in a sample of the UK population.

4.1. Understanding sustainable diets

In relation to understanding, participants were able to define sustainable eating in a manner that was consistent with and incorporated aspects of the definition by the FAO, could identify sustainable actions that they were undertaking or could undertake to make their diets more sustainable, and largely considered these to be beneficial. However, there was also a lot of uncertainty over definition and actions, and many alternative or competing definitions and actions were also given.

Some knowledge of sustainable eating and sustainable diets has previously been identified among populations (Hoek, et al., 2017; Lea & Worsley, 2008; Tobler, et al., 2011), where sustainability is also largely considered to be of benefit (Vanhonacker, et al., 2013), although considerable variation between participants is also reported (Dornhoff et al., 2020; Hartmann & Siegrist, 2017; Lea & Worsley, 2008; Tobler, et al., 2011; Vanhonacker, et al., 2013). There may be some reporting or social desirability biases towards positive answers (Hartmann & Siegrist, 2017; Lea & Worsley, 2008; Tobler, et al., 2011; Vanhonacker, et al., 2013), but what was of interest in our study was: the uncertainty that accompanied these responses; the lack of knowledge in some respondents; and the competing interests that were also given, despite a general feeling that sustainability was of value. Some participants freely admitted never having heard of sustainable diets or sustainable eating, could provide a definition or actions that were consistent with the definition by the FAO but were clearly hesitant, unsure or definitions were incomplete, or provided definitions that were focussed more on long-term maintenance, i.e. 'sustainable for me', without consideration of 'sustainable for the planet' or the idea that long-term maintenance would only be possible with consideration also of the planet, i.e. this is 'sustainable for me, because this is sustainable for the planet'. Hoek, et al., (2017) and Mann, et al., (2018) also report hesitations, difficulties and a lack of awareness in response to an open question on sustainable eating; difficulties that may stem directly from the complexity or multi-component nature of sustainable eating (Dornhoff et al., 2020; Macdiarmid, et al., 2013). The use of other more self-oriented definitions in our sample is also of interest. Other researchers have possibly not used the term 'sustainable' in relation to diet and eating, instead using terms such as 'environmentally-friendly' (Lea & Worsley, 2008) or have focused on specific relevant behaviours, such as 'reducing meat consumption' (Graça, Godinho & Truninger, 2019; Macdiarmid, et al., 2016), but Dornhoff et al., 2020, also report the use of 'egocentric' definitions of sustainable eating in an adolescent sample. The use of alternative (non-environmental) definitions suggests again a lack of awareness of the concept and details of sustainable eating, or may suggest that participants seem unlikely to consider the environment as important in relation to diet. As

mentioned in the introduction, several studies report limited awareness or knowledge of eating as a behaviour which impacts the environment, or a tendency to underestimate the importance of this (Dornhoff et al., 2020; Hartmann & Siegrist, 2017; Hoek, et al., 2017; Macdiarmid, et al., 2016; Mann, et al., 2018; Lea & Worsley, 2008; Truelove & Parks, 2012; Vanhonacker, et al., 2013). These findings suggest that increased awareness or knowledge of sustainable eating may be needed, and/or increased awareness or knowledge of the links between eating and environmental concerns.

4.2. Making changes towards sustainability

In relation to making changes, participants were willing to make changes to make their diet more sustainable, but there was again uncertainty as to what changes to make. Some social desirability bias is again likely here, but preferences were expressed explicitly for small changes, changes that could be implemented with limited cost or effort, and changes that could have high impact. Small changes have been previously recommended in dietary fields specifically in relation to body weight and body weight loss (Hill, 2009; Hills, Byrne, Lindstrom & Hill, 2013). Small changes have been argued as: more feasible to achieve and maintain than large changes; of benefit in themselves; and likely to lead to further changes as a result of greater success and self-efficacy (Hills, et al., 2013). Small changes in relation to body weight have included reducing portion sizes a little, reducing sugar intakes a little, increasing number of steps a little (Hill, 2009; Hills et al., 2013). Small easy changes, thus, typically focus on behaviours that individuals already undertake, but suggest simply a change in amount or frequency. Examples to encourage sustainable eating could include: 'Eat less meat' and 'Eat more vegetables', as opposed to 'Eat different (seasonal) vegetables', 'Eat different (more sustainable) foods, e.g. pulses', or 'Shop in different (local) shops'. To add weight to these suggestions, some resistance to reducing meat consumption through moving between product categories has been suggested, e.g. from meat to fish, or from meat to vegetables (Hoek, et al., 2017); possibly an effect of the different and unfamiliar cooking knowledge and skills that may be required for cooking these differing food types (Graça, et al., 2019; Tobler, et al., 2011).

In relation to impact, Tobler, et al., (2011) and Truelove & Parks (2012) also found associations between willingness to perform an action and belief in the impact of that specific action, and others also suggest benefits from highlighting likely impact (Vanhonacker, et al., 2013). Arguably the aspects of dietary intake of greatest environmental impact are the consumption of red meat, other meats and animal products. Research focusing on reducing meat consumption however, suggests considerable resistance to this action (Cordts, Nitzko & Spiller, 2014; Graça, et al., 2019; Hartmann & Siegrist, 2017; Hoek, et al., 2017; Macdiarmid, et al., 2016; Mann, et al., 2018; Tobler, et al., 2011), based on the taste and pleasure gained from eating meat, perceived health benefits, and the role of meat in traditional meals, and in a person's identity and culture (Cordts, et al., 2014; Graça, et al., 2019; Hoek, et al., 2017; Macdiarmid, et al., 2016; Mann, et al., 2018). Coupled with concerns over health, public perceptions or stigma, reducing meat consumption may not be a *small* or *easy* change. Others, however, have also suggested that the environmental impact of food waste is higher than that of food production (Chai, et al., 2019); for every gram of meat produced, further resources are then required if that gram of meat is not consumed. Thus, ensuring against food waste, e.g. through meal planning, and the use of leftovers, and the consumption of meats that may otherwise be wasted, such as offal, may be of value.

Also in relation to impact, Weber (2006) in a review of underlying motives for environmental action or lack of action describes the phenomenon of 'single-action-bias', where individuals seem uninclined to undertake more than one action to mitigate risks, even when further actions would have additional and independent impacts. Truelove & Parks (2012), furthermore, highlight a mismatch between the actions that have greatest impact on the environment and those that are considered to have high impact by consumers. These findings support the suggestion that a hierarchy of small and easy sustainable dietary actions based on likely impact for consumers may be of value.

Research (Cordts, et al., 2014; Macdiarmid, et al., 2016; Tobler, et al., 2011; Vanhonacker, et al., 2013) also suggests that consumers may be more willing to undertake some actions compared to others, thus additional benefit may be gained from providing alternatives or a hierarchy. Consideration of both likely impact (Tobler, et al., 2016) and consumer preferences / willingness would clearly be beneficial (Graça, et al., 2019; Tobler, et al., 2016; Vanhonacker, et al., 2013).

Considering the interests in 'sustainable for me', awareness or information on personal gain may also be useful, e.g. in terms of health benefits, reduced dietary costs, or the improved taste and pleasure that can be gained from consuming fresher, more natural, locally produced food items. Dornhoff et al. (2020), Cordts, et al. (2014), Hoek, et al. (2017) and Mann, et al. (2018) also report greater interest in health as opposed to the environment, a greater interest in what's 'good for me', and suggest the use of health benefits to motivate change. Dietary costs similarly have been suggested as a strategy to motivate change, and although cost is not always associated with environmental concerns (Tobler, et al., 2011), some of the more commonly undertaken environmental behaviours are those that incur personal benefit for the actor by reducing household costs, such as reducing the use of heating, water, single-use plastic bags and leisure-based travel (Lea & Worsley, 2008). Taste and pleasure are also recognised as important drivers of food choice and need to be considered when requesting dietary change (Hoek, et al., 2017). Taste and pleasure are often identified as key determinants or deterrents to fruit and vegetable consumption (Appleton, Dinnella, Spinelli, et al., 2017; Appleton, Dinnella, Spinelli, et al., 2019; Appleton, McGill, Neville & Woodside, 2010; Glasson, Chapman & James, 2011; Tobler, et al., 2011;) and may be a particular issue in relation to meat reduction and substitution (Macdiarmid, et al., 2016; Vanhonacker, et al., 2013). Tobler, et al., (2011), also found a preference for natural food products to enable environmentally-friendly consumption practices (Tobler, et al., 2011); an effect again also found in relation to increased vegetable consumption (Appleton, et al., 2017; 2019).

Other enablers to change that were specifically stated included the availability of sustainable foods and sustainable substitutes, and an element of social responsibility. The availability of sustainable foods, of alternatives to less sustainable foods, and the high availability of less sustainable foods have been found as important factors in sustainable food consumption before (Hartmann & Siegrist, 2017; Hoek, et al., 2017; Macdiarmid, et al., 2016; Mann, et al., 2018). Social responsibility has also been identified previously with regard to other sustainable behaviours (Truelove & Parks, 2012).

Concerns over taste, pleasure, cost, availability, time, effort and convenience, lower nutritional qualities and a lack of awareness, interest, and/or knowledge were also explicitly stated as barriers to changing behaviour. Increased information may be of value for some consumers, but concerns over the information available were expressed, largely based on complexity, likely reliability and likely agenda, and these concerns have also been expressed elsewhere (Cordts, et al., 2014; Mann, et al., 2018). Mann, et al. (2018) report an increased desire for information, but a scepticism over information that is easily available and may present a biased or unbalanced viewpoint, and participants in the study by Cordts, et al., (2014) were sceptical of fictitious information articles aiming to reduce meat consumption. Weber et al., (2022) also report recognition of potential bias within information-giving and education as a result of personal beliefs. Information source, credibility and reliability are clearly important.

Habits, competing interests and likely impact were also mentioned as barriers. Habits are commonly reported as barriers to dietary change (Van't Riet, Sijtsema, Dagevos & de Bruijn, 2011), and have been mentioned previously specifically in relation to sustainable eating (Cordts, et al., 2014; Graça, et al., 2019; Macdiarmid, et al., 2016), but small changes of limited cost may help surmount these issues. Cultural habits, perceptions of culture, and associations with social acceptance and identity may also be facilitated by small changes. Concerns about competing and more important dietary

considerations, such as health and cost, have also been expressed before (Cordts, et al., 2014; Mann, et al., 2018). The idea that sustainable eating may be a privilege, limited to those who can afford it both in terms of health, time and cost, is interesting. Weber et al. (2022) also recognize the need for consideration that not all individuals within society can afford to prioritise food consumption that is sustainable over other consumption requirements. Some participants also expressed concerns that the actions of one individual may not contribute significantly to environmental concerns, and that collective action is required. Similar concerns have also been reported elsewhere (Macdiarmid, et al., 2016; Mann, et al., 2018).

4.3. Changing behaviour

Our participants expressed a willingness to consume a diet that is more sustainable and a preference for small easy changes, but also an uncertainty of what these changes should be. How best to inform consumers of impactful changes, that each considers to be small and easy, and then encourage consumers to undertake them needs to be considered. Difficulties will arise from the provision of detailed information, largely as a result of the effort involved in digesting this, in association with concerns over the openness, objectivity and credibility of the source. Much research also suggests that information alone is insufficient to instigate action (Abrahamse, Steg, Vlek & Rothengatter, 2005; Campbell-Arvai, Arvai & Kalof, 2014), but an increased willingness to act sustainably has previously been associated with increased awareness and knowledge (Hartmann & Siegrist, 2017), and an added value for information and knowledge in propelling action has been suggested (Abrahamse, et al., 2005; Campbell-Arvai, et al., 2014).

Some benefit may be gained from the provision of simple information, such as that that could be provided in the form of a simple hierarchy, or through the use of public health messages and food labelling. Public health messages can increase awareness and knowledge (Appleton, Krumplevska, Smith, Rooney, McKinley & Woodside, 2018; Ashfield-Watt, 2006; Pollard, Miller, Daly, et al., 2007)

and associations between this knowledge and relevant behaviours have been found (Appleton, et al., 2018; Appleton, et al., 2010; Erinosh, et al., 2012). Similarly, reviews of labelling systems for nutritional information, such as the traffic light system in the UK, suggest some benefits for consumer purchasing and intakes from simple information (Campos, Doxey & Hammond, 2011; Cowburn & Stockley, 2005; Grunert & Wills, 2007), although differential impacts on different consumers are also reported (Campos, et al., 2011; Grunert & Wills, 2007; Scarborough, Matthews, Eyles, et al., 2015) and difficulties with the information provided can remain (Cowburn & Stockley, 2011; Grunert & Wills, 2007). Other simple solutions could include a clearly labelled section in the supermarket for 'products produced in the UK' or 'fruits and vegetables in season' or a government sponsored 'sustainable' badge. While a hierarchy of sustainable actions may provide consumers with ideal actions, some information to implement those, such as through the use of food labelling may still be required. Choice architecture may also offer easy information for consumers, allowing small and easy choices. Campbell-Arvai and colleagues (2014) demonstrate the value of a default menu, where the easy options are meat-free, for encouraging meat-free dish selection, and we have previously demonstrated the value of default portions of vegetables (Friis, Slo, Olsen, et al., 2017) and a 'Dish of the Day' label (Saulais, Massey, Perez-Cueto, et al., 2019) for encouraging vegetable dish selection.

Wider policies will also be beneficial. Several countries have recently implemented sustainability into their National dietary guidelines (Ahmed, Downs & Fanzo, 2019; Willett, Rockstrom, Loken, et al., 2019), incorporation into school curricula will aid awareness and knowledge of relevant concerns at an early age (Dornhoff, et al. 2020; Weber, et al. 2022); and some of the environmental behaviours that are most reported by participants are those that result from government directives, such as household recycling (Lea & Worsley, 2008; Willett, et al., 2019). Limits to the availability of less sustainable food items may be beneficial and some recognition of corporate responsibility in the form of subsidies and taxation for food manufacturers or retailers may also help (Willett, et al.,

2019). In recognition that not everyone can afford to prioritise sustainability, strategies such as taxation on unsustainable foods for the consumer may receive little support (Vanhonacker, et al., 2013; Van't Riet, et al., 2011).

Suggestions for increasing understanding and engagement with sustainable dietary behaviour, both for the individual and for wider society, are summarized in Box 1.

Box 1 about here

4.4. Strengths and Limitations

Strengths of our study lie in the inclusion of a range of participants and the use of in-depth interviews, to provide many and a wide range of opinions. Our study is limited by the necessary small and select sample (Braun & Clarke, 2013), limiting the analyses and conclusions that can be made (Malterud 2001). We deliberately recruited individuals from different genders, from a range of ages and with a range of living circumstances and cooking responsibilities to provide a wide range of opinions, but consequently can draw limited comparisons based on these characteristics due to the very limited numbers. A population-wide survey to allow these comparisons would be of interest. Study of additional population groups, e.g. adolescents, mature adults or older adults would also be of value. Important constraints to dietary choices, such as food cost or freedom of choice, will differ among different population groups (Appleton et al., 2017; 2019; Weber et al., 2022). Our study was also conducted during a period of some lifestyle restrictions due to the COVID-19 pandemic, and over the late winter period. Some effects of the restrictions were reported by participants, but it is possible that not all influences were realised, e.g. increased snack consumption while working at home. Some effects as a result of the season may also have occurred. Winter in the UK is notably more commonly associated with meat consumption, and this may have resulted in a greater focus on and resistance to reducing meat consumption, than would be expressed at other times of the

year. The generalisability of our study is limited by the sample involved and the context in which it was conducted (Braun & Clarke, 2013; Malterud, 2001), but we have no reason to believe that our findings will not generalise to the majority of the young adult UK population. Use of a number of recruitment methods and advertisements for a very generic study were intended to minimize responder bias. Social desirability may have affected some of our findings (Braun & Clarke, 2013), but given the suggestions of uncertainty, resistance and a number of deterrents toward sustainability, we think this is unlikely. Our research question was also very broad, to consider public understanding of sustainable diets in general, thus specific aspects of sustainable eating, the relative importance of one aspect compared to another were not queried (e.g. Dornhoff, et al., 2020), and we didn't ask specifically about certain food-related behaviours (e.g Macdiarmid, et al. 2013). Comments in relation to these matters are only mentioned where these arose spontaneously, and further opinions may have been triggered by more specific questioning. Further investigations in a larger sample would clearly be of value.

4.5. Conclusions

In conclusion, this interview study aimed to explore public understanding of sustainable diets and any willingness or attempts to make changes towards sustainability in a sample of the UK population. Participants were able to define sustainable eating in a manner that was consistent with the definition by the FAO, could identify sustainable actions that they were undertaking or could undertake, and largely considered these to be beneficial, but there was a lot of uncertainty, and alternative or competing definitions of sustainability and of sustainable actions were also given. Participants were also willing to make changes to make their diet more sustainable, and preferences were expressed for small easy changes of high impact, but there was again uncertainty as to what these changes should be. Investigation of both public understanding and willing to change towards more sustainable diets in a larger more representative sample would be of value. Based on our findings, suggestions to increase understanding and willingness to change could include increasing

public awareness and knowledge of sustainable diets and the links between eating and sustainability; focusing on small easy changes of likely impact and personal benefit; increasing availability and accessibility to sustainable diets. Consideration of consumer preferences and abilities, however, will also be needed.

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AUTHOR CONTRIBUTIONS

The study was conceived by KMA, and designed by BW and KMA. BW undertook all data collection. BW, SMW and KMA undertook all initial data analyses, and all subsequent and final analyses were agreed by all authors. BW and DJG wrote the first draft of the manuscript. All authors critically reviewed this draft, and have approved the final article.

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DECLARATION OF INTERESTS

The authors have no interests to declare.

DATA AVAILABILITY STATEMENT

All transcripts are available on request from the corresponding author or from Bournemouth University's Research Data Repository BORDaR.

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Table 1: Brief characteristics of participants (N=21)

No.	Gender	Age	Living Circumstances and Cooking Responsibilities
1	male	23	Lives with parents, take turns to cook
2	male	23	Lives with family, is mostly cooked for
3	female	24	Lives with partner, sometimes cooks
4	male	27	Lives with partner, is mostly cooked for
5	male	22	Lives with parents, sometimes cooks
6	male	23	Lives with friends, usually cooks for himself
7	female	24	Lives with partner, sometimes cooks
8	male	22	Lives with parents, cooks for himself
9	male	22	Lives with friends, cooks for himself
10	female	30	Lives alone, cooks for herself
11	female	57	Lives with family, usually cooks
12	female	23	Lives with housemate, take turns to cook
13	female	22	Lives with housemate, take turns to cook
14	female	26	Lives with partner, usually cooks
15	male	58	Lives with family, recently started cooking due to family circumstances
16	female	23	Lives with parents, usually cooks
17	female	53	Lives with family, is usually cooked for
18	male	31	Lives with housemate, cooks for himself
19	male	23	Lives with family, is cooked for and cooks for himself
20	female	23	Lives with parents, is usually cooked for
21	female	23	Lives with parents, is usually cooked for

Box 1: Suggestions for increasing understanding and engagement with sustainable dietary behaviour

- Increase public awareness and knowledge of sustainable diets
- Increase public awareness and knowledge of the links between eating and sustainability concerns
- Focus on small and easy changes, preferably by suggesting changes to the amount or frequency of existing behaviours
- Focus on the small easy changes of greatest impact and/or provide a hierarchy of changes based on impact
- Highlight personal benefit
- Keep consumer preferences, abilities and willingness to perform some actions in mind.
- Increase the availability and accessibility of sustainable foods
- Ensure information is clear, easy to access and stems from credible, objective sources
- Provide information in simple forms, such as public health messages, food labels and badges
- Make sustainable choices the easy option, e.g. through nudging and choice architecture
- Provide government guidelines and directives for the consumer
- Provide government guidelines and directives for industry