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Sustainable Healthy Diet Transitions: An Examination of Media Discourse Concerning Beef in the United Kingdom From 2018 to 2022

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ABSTRACT

The role of diet in individual and planetary health is increasingly scrutinised as consumers are encouraged to make food choices that balance health and sustainability, particularly with beef. While prior research has considered reduction from the perspective of alternate product acceptance, the social context of beef is less understood. Media plays a crucial role in shaping narratives concerning beef's future in agri-food systems, influencing consumer behaviour and environmental outcomes. Employing content and thematic analysis, this study examines how beef has been framed in the context of sustainable healthy diets, analysing 223 UK-based news articles published from 2018 to 2022. Findings reveal significant tensions between the environmental sustainability of beef compared to reduced-meat and meat-free diets. While environmental concerns dominate, narratives around social and economic sustainability are emerging, addressing consumer affordability and wellbeing in rural communities. This study highlights the complex trade-offs between health and sustainability dimensions, offering insights into beef's contentious role in sustainable diets and emergent tensions for consumers navigating this space.

1 | Introduction

With growing focus on the impact of dietary practices on individual and planetary wellbeing (Michielsen and van der Horst 2022; Morris 2018; Rampalli et al. 2023; Willett et al. 2019), there is increased emphasis on mechanisms to support shifts towards more sustainable healthy consumption practices at both agrifood system and individual consumer choice levels (Rampalli et al. 2023). However, consumer efforts to integrate more sustainable practices into dietary patterns are set against existing beliefs and routines which ofttimes conflict with sustainability and health goals. Given a lack of consensus concerning how best to balance health and sustainability agendas, governments are adopting varied strategies to adapting agrifood systems to support sustainable healthy diets. Against this backdrop, the dual focus of sustainability and health in food choices further complicates decision making for citizen-consumers as understanding and discourse concerning food evolves, expanding beyond individual consumption considerations to encompass broader societal impacts. Prior research has demonstrated that media actors can play a significant role in shaping the information landscape and orienting readers' understanding. While moves towards a 'planetary health diet' reflect a desire to respect planetary boundaries (Marinova and Bogueva 2022; Willett et al. 2019), there is uncertainty as to what constitutes a 'sustainable healthy diet' (Steenson and Buttriss 2020) as further complicated by inconsistent use of 'sustainability' in media discourse (Fischer et al. 2017). Despite disagreements and variations in food based dietary guidelines internationally (Kovacs et al. 2021), there is a growing view that meat production needs to be reduced (Willett et al. 2019), with beef emerging as a battleground for climate and health activists (Rampalli et al. 2023). Meat holds cultural significance (Sievert

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et al. 2022), being closely tied to practices, identity, status and culture (Gough 2007), while conferring various health benefits and delivering key nutrients in an enjoyable and bioavailable format (Rampalli et al. 2023). This is further complicated by the reporting context, as cross-cultural research by Happer and Wellesley (2019) highlight how cultural context influences interpretation of new sustainability information from media sources. Equally, beef has been associated with greenhouse gas emissions and non-communicable dietary diseases, such as cardiovascular disease (Shi et al. 2023) and obesity (Wang and Beydoun 2009). Indeed, across both sustainability dimensions (environment, society, economy) and human health, beef production and consumption presents trade-offs and tensions at individual, societal and environmental levels (Castonguay et al. 2023), thereby increasing the complexities in media's framing of beef's role in sustainable healthy diets.

It has been argued that historically the sustainability implications of meat have been a 'blind spot' in media reporting in many developed countries (Rooney 2025, 1364), such as Italy, Spain, the United Kingdom and United States (Almiron and Zoppeddu 2015; Kristiansen et al. 2021), with efforts to curtail meat consumption in response to climate change often highly polarised in the media, as was the case for the Green New Deal in the United States (Rooney 2025). Beyond sustainability, there is also a need to ensure that meat reduction does not adversely impact diet quality and nutritional adequacy (Strid et al. 2023). Globally the nutritional implications of meat consumption vary, with regional variations including overconsumption and nutritional inadequacy (McNeill and Van Elswyk 2012) requiring different conceptualisations of meat's role in sustainable healthy diets and subsequent framing of same. While prior research has demonstrated the role of media in setting agendas, the specific interaction of these *health* and *sustainability* agendas, which gives rise to inherent tensions in a food context, is less well understood. Against the backdrop of growing plant-based meat alternatives (PBMAs) markets (Good Food Institute 2023), Michielsen and van der Horst (2022) note that recent research has overemphasised consumer acceptance of meat alternatives, resulting in an overly myopic understanding of meat environments, viewed through the lens of product acceptance. This dominant focus on PBMA acceptability in meat reduction discourse is unfortunate, as transitioning agrifood systems to reduced meat production impacts not only citizen-consumers' dietary practices, but also agrifood system stakeholders and society more broadly (Marinova and Bogueva 2022). This research therefore seeks to move beyond considering beef reduction through a product acceptance and market lens, to understand beef's place within broader socio-cultural discourse and agrifood system context. In so doing, this study aims to understand how tensions between health and sustainability agendas are framed and addressed.

To better understand which tensions are identified and whether/how these tensions are resolved, this paper explores the framing of dietary practices among legacy news media outlets. Analysing evolving news discourse in the context of beef at the nexus of health and sustainability reporting in the UK context, this study adopts a qualitative approach using frame analysis and thematic analysis on 223 newspaper articles published in UK newspapers between 2018 and 2022. In so doing, this study seeks to address the following question: *How have legacy media actors framed tensions between health and sustainability priorities and associated solutions when reporting on beef consumption in the UK?*

In 2019 the EAT-Lancet commissioned Willett et al. (2019) report on planetary health diets brought sustainable healthy diets into sharp focus, highlighting the need to implement radical change across agrifood systems through reduced emissions, improved efficiencies and waste reduction to respect planetary boundaries (Steenson and Buttriss 2020). There is increasing momentum behind reducing meat consumption, including through meat reduction policies (Michielsen and van der Horst 2022), revised dietary recommendations (Steenson and Buttriss 2020), reduced beef production (Kearney 2022), and promotion of PMBAs. Although change is required across agrifood systems to ameliorate adverse planetary outcomes, there is recognition that industry level change alone is insufficient if not met with change in individuals' food choices (Rampalli et al. 2023). These individual dietary changes are predicated on both understanding and sensemaking, as essential prerequisites to motivating behaviour change. This study seeks to advance our understanding of how expert opinion is portrayed within the information landscape, drawing on frame theory and agenda setting theory to understand how tensions are represented in reporting, what solutions emerge, and where responsibility lies. A conceptual framework detailing reporting tensions arising in a healthy sustainable diet context is proposed and implications for other reporting contexts are discussed. In so do, this study contributes to the growing literature on sustainability communications to understand how sustainability tensions are framed by media actors and the potential implications for beef production.

2 | Literature Review

The literature review consists of three sections which outline the importance of legacy media derived information in citizen-consumer sensemaking, the role of legacy media through its agenda framing function in constructing the information landscape and gaps within the literature which this empirical context addresses.

2.1 | Sensemaking, Dissonance and Dietary Choices in Contested Consumption Spaces

Sustainable healthy food choices are complicated by food engendering a combination of hedonic, functional, social and deeply rooted cultural meanings (Monterrosa et al. 2020), intersecting with gender roles (Gough 2007; Peeters et al. 2023), heritage and personal beliefs. Consequently, food choice is multifaceted, influenced by affordability perceptions (Fox et al. 2023; Miller et al. 2021), ease of access (Darmon and Drewnowski 2015), habits (Cheah et al. 2020), knowledge and motivation (Hyland et al. 2024). As such, proposed dietary shifts often face resistance, with suggested reimagining of the role of specific foods, such as beef resulting in food occupying a contested politicised space. This results in consumers

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engaging with new narratives as presented by various experts, opinion leaders and media when considering foods' role within the context of sustainable development. Sensemaking does not occur in a vacuum, with existing meanings shaping understanding. Additionally, emerging messaging on sustainable healthy food practices may encompass seemingly contradictory information, evolving understanding of meat's role in healthy diets, and low trust in authorities, owing in part to meat being framed as a flexible concept, aligned to respective actors' agendas (Leroy et al. 2018). It is within this context, where experts and those with vested interests publicly debate and negotiate beef's dietary role, that consumers engage in sensemaking to inform dietary choices.

In many Western countries, food topics have traditionally remained largely unpublicised, relegated to the lifestyle and cooking sections of traditional media, save food scandals and recalls (Kley et al. 2023). However, this has begun to change, with media framing of beef's dietary role emerging as an important area of enquiry, owing to the sustainability implications of ruminant agriculture (Mroz and Painter 2023; Sievert et al. 2022). Prior research highlights how incongruence between message framing of PMBAs and political ideology can adversely impact purchase motivations (Yule and Cummings 2023), such that media content and framing potentially impact dietary choices; however, less is known regarding the framing of beef in the sustainable healthy diet context.

Consequently, evolving narratives, which may at times support or compete with one another, give rise to tensions for consumers reconciling potentially conflicting priorities. While cognitive dissonance theory has been explored at length to understand individual tensions in meat transitions (Dowsett et al. 2018; Mann and Renaux 2022), the role of the broader information and social landscape in framing attitudes towards beef reduction has received comparably little attention. As such there has been increasing recognition of the need to situate cognitive dissonance within its broader social context. For instance, Panagiotou and Kadianaki (2019) highlight the importance of cognitive polyphasia in understanding meat consumption patterns among consumers. Cognitive polyphasia, which builds on Social Representations Theory can assist in bridging the gap between individual cognition and the social context in which knowledge is created and framed, recognising that individuals' thoughts and activities are deeply related to the social context within they occur (Provencher 2011). As such, cognitive polyphasia theory highlights the various different fields of understanding that can exist at individual, institutional, or group levels (Renedo and Jovchelovitch 2007), underscoring the importance of mapping the information landscape in which cognition occurs to understand the multiple social realities which may be constructed in understanding beef reduction proposals. Consequently, understanding dialogues pertaining to beef's role in sustainability and healthy spaces is necessary to identify tensions which citizen-consumers encounter when engaging in sensemaking and media's role in framing this discourse and setting agendas.

2.2 | Media and Agenda Setting

Despite media fragmentation, legacy news media continue to impact food consumption patterns, dietary preferences and health (Fry et al. 2022; Kley et al. 2023). In the sustainability context, media influences which sustainability dimensions receive scrutiny (Zec 2024), the depth of exposure to sustainability (Holt and Barkemeyer 2012), representations of sustainability policy (Kouri and Clarke 2014) and the means through which sustainability metrics frame topics to the public (Morse 2013). At the same time, media have received criticism, with Lock et al. (2024) highlighting a lack of adequate coverage of public sustainability debate in the Dutch context, and Yacoumis (2018) arguing a lack of depth and breadth in discussion of sustainable development in Australian media. Equally, food media research has offered valuable insights on issues including food safety (De Brún et al. 2016), meat reduction (Fry et al. 2022) and dietary health (Leroy et al. 2018). There has been increasing academic interest in media portrayal of contested foods such as beef (Mroz and Painter 2023; Sievert et al. 2022), alongside dietary practices associated with environmental outcomes such as meat consumption (Sievert et al. 2022), veganism (Peeters et al. 2023), vegetarianism (Kley et al. 2023), flexitarianism (Marinova and Bogueva 2022) and meat reduction/curtailment efforts (Michielsen and van der Horst 2022). It is worth noting that a number of these proposed changes are of particular relevance in more affluent regions where there is a high prevalence of meat consumption (Gerbens-Leenes et al. 2010), such that policies proposed have varying applicability across regions owing to factors including levels of meat consumption and nutritional adequacy. Although the relevance of meat reduction policies may vary across regions, understanding issues around social and marketing acceptance of meat can inform framing of food policy messaging in other regions.

Media also merits attention owing to its role in agenda setting, that is, identifying issues meriting consideration (Langer and Gruber 2021; Princen 2018; Sievert et al. 2022). Princen (2018) notes that agenda setting at its core involves a struggle for attention, as multiple issues vie for limited consideration, with media coverage over time, implicitly signifying a topic's editorial importance (Boykoff 2008). Through agenda setting media actors can raise the perceived importance of issues among the public through frequent and prominent portrayal, in turn, shaping the information landscape (McCombs et al. 2014). Understanding how media exercises its agenda setting function is therefore important as media agendas help shape the information environment in which citizen-consumer decision-making occurs. While the limitations of information alone in affecting behaviour change must be recognised, certain channels can have a disproportionate effect on key stakeholders, with legacy media's influencing political agendas (Langer and Gruber 2021) and informing consumer sensemaking. Although the exact nature of media's agenda setting role in the policy development process is disputed, it is generally agreed that media agendas inform the policy-making process (Princen 2018) alongside consumption-relevant discourse. This is important as media can both directly inform food choice by providing choice-relevant information, and indirectly through informing food related policies, The latter in turn has potential to impact behaviour and choice through downstream/upstream interventions, such as promotion of regenerative farming, food waste reduction, demotion of (un)healthy products through taxation and supporting the development of novel food products.

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2.3 | Research Gap

While the environmental narrative concerning beef has received increased attention (Mroz and Painter 2023), reporting tensions arising from beef's role at the nexus of sustainability and health agendas is less well understood. Our study seeks to address how narratives concerning beef's role in sustainable health diets have unfolded in recent years by analysing coverage pre- and post- EAT-Lancet report publication in January 2019. As these agendas unfold, media has the potential to influence discourse, particularly where radical change recommendations are put forward. As a reporting context replete with tensions, contradictions, and limitations associated with transitioning agrifood systems towards supporting more sustainable and healthy diets and set against the backdrop of scientific and public uncertainty, beef offers an interesting case through which to consider emerging agendas, associated stakeholders and how these are reconciled. Additionally, the UK provides an interesting empirical context through which to consider discourse at this sustainability and health junction, as despite recent trends towards reduced meat consumption (Vonderschmidt et al. 2024), there remains a need to accelerate meat reduction to meet sustainability targets (Stewart et al. 2021). As such, the study seeks to address the following questions:

RQ1. *How did legacy media actors frame the health and sustainability priorities relating to beef consumption in the United Kingdom around the release of the EAT-Lancet Commission report on healthy diets from sustainable food systems from 2018 to 2022?*

RQ2. *What tensions existed regarding the role of beef in supporting health and sustainability goals?*

In the following sections we detail the research context, highlighting the data collection and analysis process. We then proceed to present key findings and discuss the implications of these for both the beef context and the broader media framing literature.

3 | Materials and Methods

Building on agenda setting theory and frame analysis this study adopts a qualitative approach to explore frames, narrative tonalities, and advocate viewpoints to identify emerging discourse on beef's role in sustainable healthy diets. Here media discourse refers to communications through a broadcast platform whereby discourse is steered towards a '*non-present*' reader (O'Keeffe 2013, 441). Frame analysis is widely used to analyse media coverage of pressing social phenomena (Matthes 2009; Zec 2024) and allows for exploration of media reporting, by paying attention to broad organising themes, characters, actions and story elements to interrogate how narratives are constructed and developed, thereby revealing patterns of news media influence and issue salience (Friedlander et al. 2014). Although there is a lack of clear consensus regarding what constitutes a frame (Matthes 2009), it is generally agreed that frames 'call attention to some aspects of reality while obscuring other elements, which might lead audiences to have different reactions.' (Entman 1993, 55). Within the broader tradition of frame analysis there are various approaches towards analysing the content of media frames, which Matthes and Kohring (2008) identify as falling into one of five broad categories, hermeneutic, linguistic, manual holistic, computer-assisted and deductive approaches. Hermeneutic and manual holistic approaches possess a high likelihood of introducing subjectivity into frame development and coding. The high complexity of linguistic approaches limits their potential for application on larger datasets, whereas computer assisted analysis increases objectivity, but adversely impacts analysis depth (Matthes and Kohring 2008). In this study we adopt a deductive approach to content analysis, this was achieved through independent testing and refining of the coding frame prior to analysing the full dataset to reduce potential researcher bias arising from subjective interpretation of the coding frame (Elo et al. 2014).

3.1 | Sampling

News reporting from 1-Jan 2018 to 31-Dec 2022 were sampled to capture reporting both prior and subsequent to the launch of the EAT-Lancet report in January 2019. This study focused on media reporting in the UK context, given the size of the market's readership, historic significance of meat (Nungesser and Winter 2021), prevalence of discussions on non-communicable dietary diseases such as CVD (Bhatnagar et al. 2016), culturally embedded agricultural background and varied dietary preferences. The UK was determined to offer fertile ground on which to consider the broader health and environmental tensions associated with proposed transitions towards a planetary health diet, comprising reduced beef consumption. Commensurate with previous studies exploring news media reporting, a fully licensed version of the Nexis UK database (LexisNexis, n.d.) was employed to sample legacy media reporting (De Brún et al. 2016; Fry et al. 2022; Morris 2018). Multiple Boolean search strings were tested to ensure that the sampled material comprehensively captured reporting on beef at the sustainability health nexus (see Table 1). In developing this search string, consideration was given to the need to have articles which adequately address the health and sustainability nexus for beef, while avoiding news around dietary trends related to sustainability generally but not specific to beef. For example, PMBAs and other meat substitutes are widely covered in media discourse and prior research (Tziva et al. 2023). Consequently, this study focused on those articles specifically addressing beef discourses such that PMBAs featured only to the extent that they formed part of beef discourse.

To ensure news article relevance a protocol for a multi-stage filtering of results was developed (Figure 1). Duplicate content and irrelevant reporting outlets (e.g., not targeted towards the general population and non-print media) were initially excluded. Subsequently all publications were reviewed independently by two members of the research team to ensure included news articles substantively addressed the issues of health and sustainability within a beef context. Where news articles only substantively addressed one of these issues (i.e., health or sustainability) they were excluded. A final review of eligibility was conducted by the third researcher responsible

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for implementing the coding scheme. Through iterative peer debriefing of content eligibility, 223 news articles were included in the final analysis, and are listed in Supporting Information: Appendix A. Overemphasis on broadsheet media coverage, particularly in the UK which enjoys high levels of tabloid circulation, serves to potentially ignore the media influence on a broad, predominantly 'working class' readership (Boykoff 2008). Consequently, congruent with prior research (Morris 2018), this study includes reporting across the spectrum of broadsheet and tabloid outlets, to capture discourses across respective outlets' target audiences.

TABLE 1 | Search criteria.

Database	Nexis
Category	News
Search string	'health' OR 'healthy' AND 'beef' AND 'sustainable' AND 'diet'
Timeline	01 Jan 2018–31 Dec 2022
Region	Europe/United Kingdom of Great Britain and Northern Ireland
Source type	Newspapers OR web-based publications, OR industry trade press OR video OR newswires AND press releases OR news transcripts OR magazines AND Journals OR audio OR news
Industry	Agriculture, forestry, fishing AND hunting OR consumer products OR energy AND utilities OR environmental industry OR food AND beverage OR manufacturing OR retail AND wholesale trade

3.2 | Data Analysis

For analytical purposes, each news article was treated as a unit of analysis, and content analysis was employed to identify frames. A preliminary codebook was developed based on the work of Di Gregorio et al. (2013), who built on the work of Boykoff (2008) and Boykoff and Mansfield (2008). In line with Di Gregorio et al. (2013), the codebook included frame levels (primary and secondary), frame types (diagnostic, prognostic, descriptive, motivational, and symptomatic), meta topics, and advocates. Adaptions to meta-topics and advocate types were made where necessary to account for the coding context and research questions (see Supporting Information: Appendix B). A subset of data was coded using NVivo, and through iterative peer debriefing, the codebook was assessed for completeness before being finalised and applied to the full dataset. Drawing on Matthes and Kohring (2008) we note that frame elements may group together to form unique and interesting patterns of analytical value. Using content analysis as a starting point, we reviewed both frames and the patterns which emerged across the various elements of our codebook. Commensurate with prior media research, we apply thematic analysis (Morris 2018; Sievert et al. 2022) to add further depth of analysis to the content analysis outlined above, exploring themes within and across content codes. The content analysis also provided a basis to identify frequently recurring topics and frames and to identify patterns in the data to guide our thematic analysis. Initial thematic codes were created both inductively and deductively and refined to yield four main themes discussed below.

4 | Results[1]

The following sections outline key findings, comprising a review of trends within the data as established through content analysis

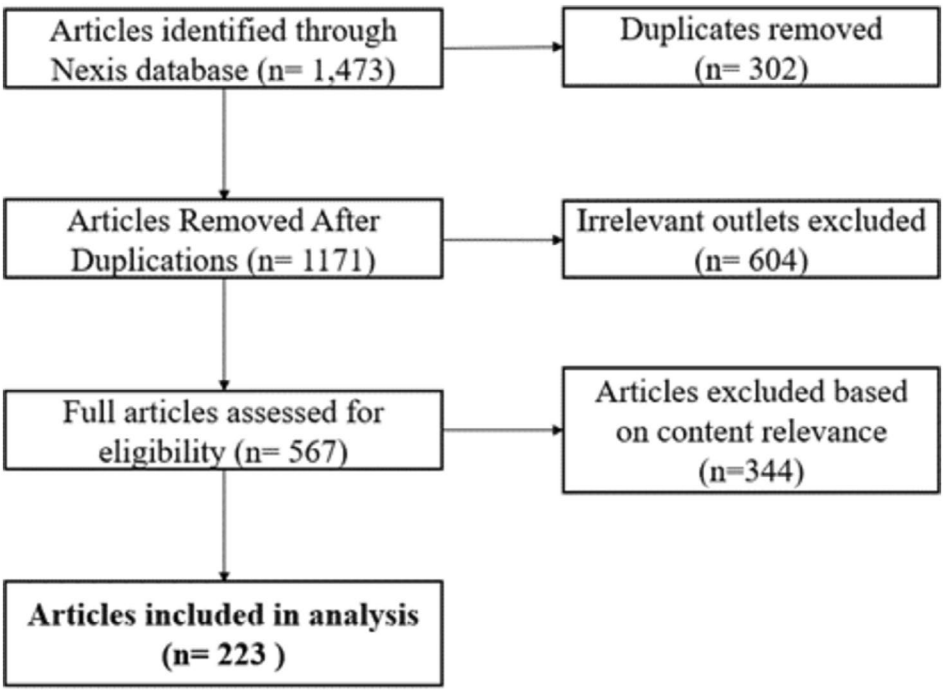

FIGURE 1 | Eligibility screening process.

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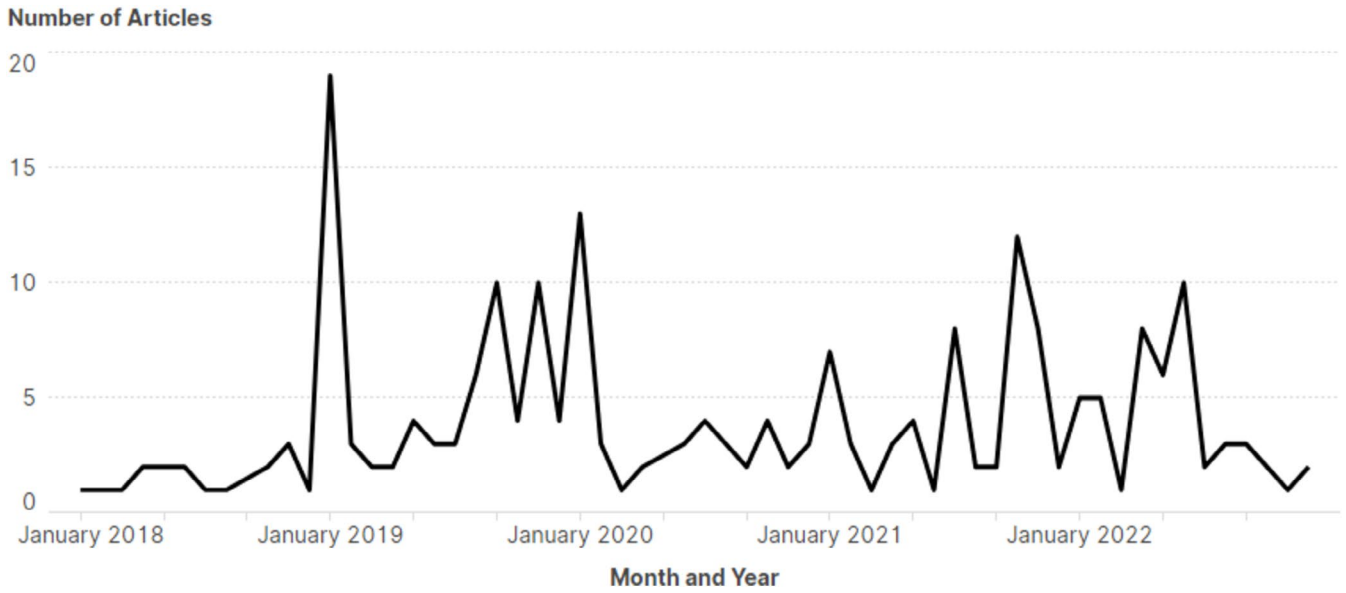

FIGURE 2 | Distribution of included news articles over reporting period (by month).

TABLE 2 | Distribution of news articles analysed (2018–2022).

Year	Number of news articles	Percent
2018	15	6.7
2019	70	31.4
2020	37	16.6
2021	53	23.8
2022	48	21.5
Total	223	100

and recurring themes related to representations of health and sustainability.

4.1 | Descriptive Analysis—Advocates and Framing

The frequency of news articles sampled peaked in January 2019 to coincide with the publication of the EAT-Lancet report (Figure 2). Post publication of the Willett et al. (2019) report, there has generally been an increased frequency of news articles considering beef's role at the intersection of sustainability and health when compared to the 2018 period (see Table 2).

The trend of reporting was characterised by peaks during January, coinciding with increased interest in changes in dietary patterns typified by 'New Year's Resolution' practices (see Figure 2). However, per our screening criteria, any news articles which discussed diet alone without substantively addressing issues of both sustainability and health were excluded.

Analysis of frame types by year suggests reporting was predominantly diagnostic in nature (see Figure 3), wherein articles identified the underlying problems giving rise to discourse on a revised dietary role of beef. This was followed by prognostic frames, wherein prospective solutions and strategies for ameliorating problems identified were proposed, comprising solutions affecting stakeholders across agrifood systems. Generally, reporting was characterised by relatively limited attempts to motivate change among readership or symptomatizing the problem. It is assumed low level of symptomizing was indicative of general understanding of the climate crisis among respective outlets' readership, and the consequences of same.

Reflecting the health and sustainability dimensions under consideration, research-based advocates were represented to a large extent in reporting, holding a substantial share of voice across news articles analysed, although varying across years (see Table 3). It is worth noting that homogeneity within advocacy groups did not preclude heterogeneity in viewpoints expressed, and as detailed in the following section, the breadth of viewpoints of perspectives both across and within advocate categories gave rise to apparently discrepant interpretations of beef's role in future diets. In particular, among research-based advocates, lack of consensus both within and between units of analysis was observed with implications for the framing of beef's role in future diets.

4.2 | Tensions Within the Reporting Landscape

Both within and between articles tensions were evident in the broader meat discourse encompassing explicitly acknowledged discrepancies, through highlighting lack of scientific consensus and apparent discrepant findings, alongside more implicit contradictions. Tensions within the scientific community came to the fore across outlets illustrating *intra-institutional tensions*. In particular disagreements and a lack of consensus regarding science-based dietary recommendations highlight how scientific research may be leveraged in furthering agendas including claims that some research 'advocates for plant-based diets by exaggerating GHG (greenhouse gas)

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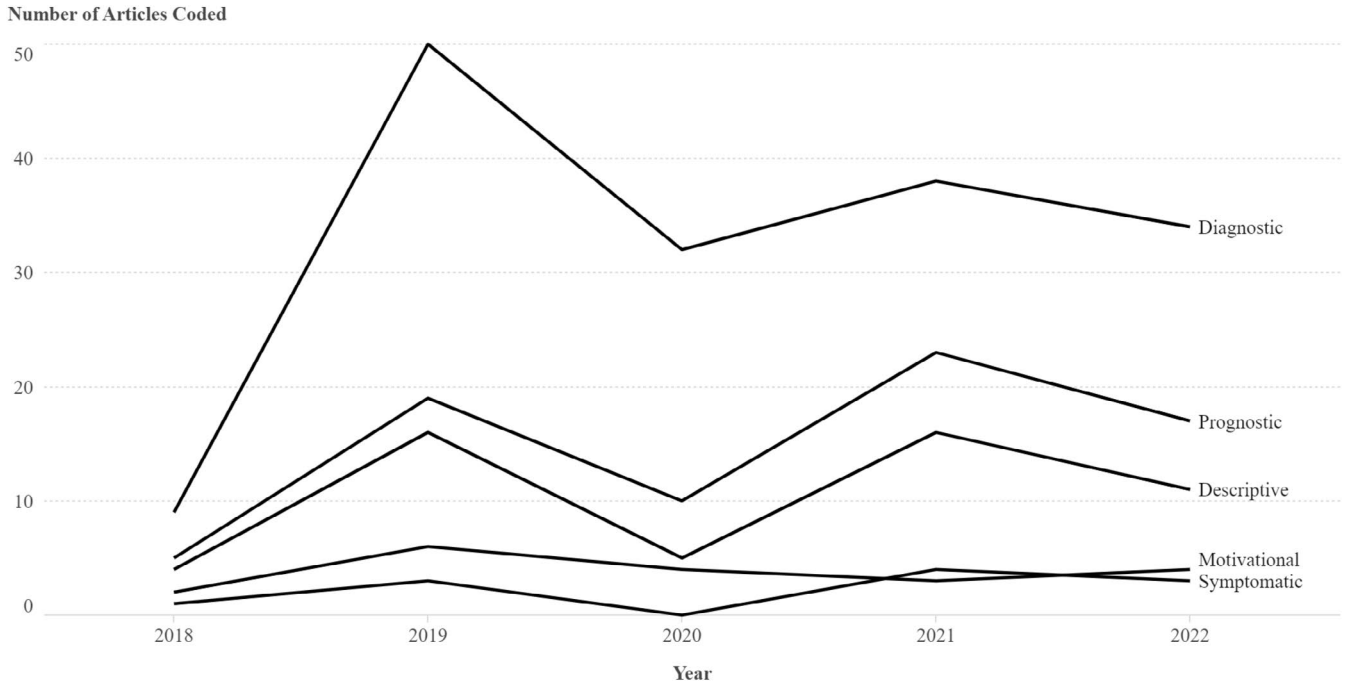

FIGURE 3 | Distribution of frame type frequency over reporting period (by year).

TABLE 3 | Share of voice by advocate over reporting period (2018–2022).

	By year					Aggregate	
Advocate	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**	**Percent**
Research	5	29	7	18	18	77	28.84
Farmer's or meat industry group	2	18	10	18	12	60	22.47
Individual	2	9	6	12	8	37	13.86
Business–industry	4	10	4	16	5	35	13.11
NGOs	0	15	4	9	7	35	13.11
Government–policy–state actor	0	8	3	6	6	23	8.61
Total	9	89	34	79	56	267	100.00

numbers, failing to fully account for carbon sequestration, using a methane metric that overestimates the methane from livestock, and downplaying nutritional considerations' (#167). Aside from conflicting viewpoints and suggested blind spots within the scientific community, claims of misinterpretation of information or faulty science also arose. 'Proponents of a plant-based diet will regularly point the finger at ruminant agriculture for its contribution to greenhouse gases, often citing grossly inflated figures, while calling for a reduction in livestock numbers.' (#133). Although not evident across all news articles, lack of scientific consensus regarding the link between beef and health was also noted. '"There is no rigorous clinical trial evidence showing that red meat has any ill effects on health", *said Russell Cross, professor of animal health at Texas A&M University*' (#224). Tensions arising from *conflicting sustainability priorities* were also evident. In particular, criticism of the EAT-Lancet report asserted that proposed recommendations would have adverse consequences for the health of people and planet, with such claims being supported by a number of research advocates along with meat industry representatives across reporting.

Tensions arose not only through consumption consequences but also through the practices and motives of those advocating particular viewpoints. Such *inter-institutional disagreements* were evident in for example, the meat industry being accused by researchers of engaging in PR practices akin to other harmful commodities such as tobacco. Conflicts across stakeholders were also evident, particularly between beef industry groups and those espousing a reduced beef diet, including accusations of broadcasters engaging in '*one-sided messaging*' (#246) to further particular agendas. Clashes between sustainability and health objectives were often cited as limitations of plans to reduce beef production, with the emerging nuance on sustainability narratives which incorporate social and economic sustainability and the spillover effect on wellbeing acting as a vehicle to counter arguments for reduced beef production 'Such arguments fail to acknowledge the impact such actions could have, not only on

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public health, but on the social fabric of our rural communities, and as clearly demonstrated by the war in Ukraine, national food security.' (#146).

Equally, it is evident that agrifood system actors are portrayed as having complex roles. For instance, considering the cost of transitioning towards more sustainable beef production, *inequitable stakeholder impacts* between primary producers, food processors and retailers are noted, with economic pressures from the latter two suggested as frustrating environmental sustainability efforts of the former. We see reporting of investment by large food companies in sustainable PBMAs billed as a potential solution to environmental challenges, while at the same time, some of these foods are highlighted as being ultra-processed and potentially undermining health goals, highlighting *environmental and health trade-offs*. In this regard, reporting increasingly emphasised the inherent complexity of agrifood systems and the difficulty of sustainable food choice for consumers at the most fundamental information gathering and sensemaking stages of decision-making.

4.3 | The Sustainability Imperative

Recognising the multidimensionality of sustainability, reporting across sustainability dimensions (i.e., economic, environmental and social) was considered. Commensurate with prevailing discussions regarding beef's contribution to CO_2 emissions, sustainability was framed predominantly in terms of beef's environmental impact, albeit with some limited recognition of other dimensions (Figure 4).

Practical considerations around land use highlighted limitations with a standardised approach to reduced meat production given the limited value of various agricultural regions for arable farming 'In the UK, two thirds of the farmland is only suitable for grazing livestock. Even cows and sheep can be part of the solution; as they munch on and trample grasslands, they spur growth, accelerating the carbon cycle, and holding more gas in the soil' (#626). Variations in the impact of beef production across countries were noted as important in assessing the benefits associated with reduced beef consumption globally, highlighting how beef produced in certain regions may be less environmentally deleterious 'a pound of beef produced in Paraguay contributes nearly 17 times more greenhouse gases than a pound of beef produced in Denmark' (#123). At the same time, media narratives also acknowledged the need for nuance in evaluating the sustainability of plant-based diets, with discourse pertaining to the climatarian diet also drawing attention to trade-offs between plant-based alternatives and the processing and food miles involved in production. As such, there was an emerging need to position international debates, trends and recommendations within a local context, recognising the variation across regional requirements.

Where issues of economic sustainability arose, these centred predominantly around the role of agriculture in stimulating rural economic activity, providing rural employment and wellbeing in rural communities more broadly. Cast against an environmental imperative, unemployment arising from reduced meat production was framed as both a temporary pain, necessary to mitigate meat's environmental impact, as well as offering potential for new forms of agricultural employment. Highlighting the intersection of health and sustainability, reported economic benefits of plant-based diets included reduced healthcare costs stemming from anticipated reductions in dietary diseases linked to red meat 'were the world to adopt a vegan diet by 2050, the global economy would benefit to the tune of $1.1tn savings in healthcare costs' (#1411). Tensions between economic and environmental priorities were also identified, particularly, highlighting the cost pressures farmers face and the financial viability of implementing sustainable practices against the backdrop of price pressures from 'big business' 'Farmers want to be a force for change, but without the right legislative levers to help them make the

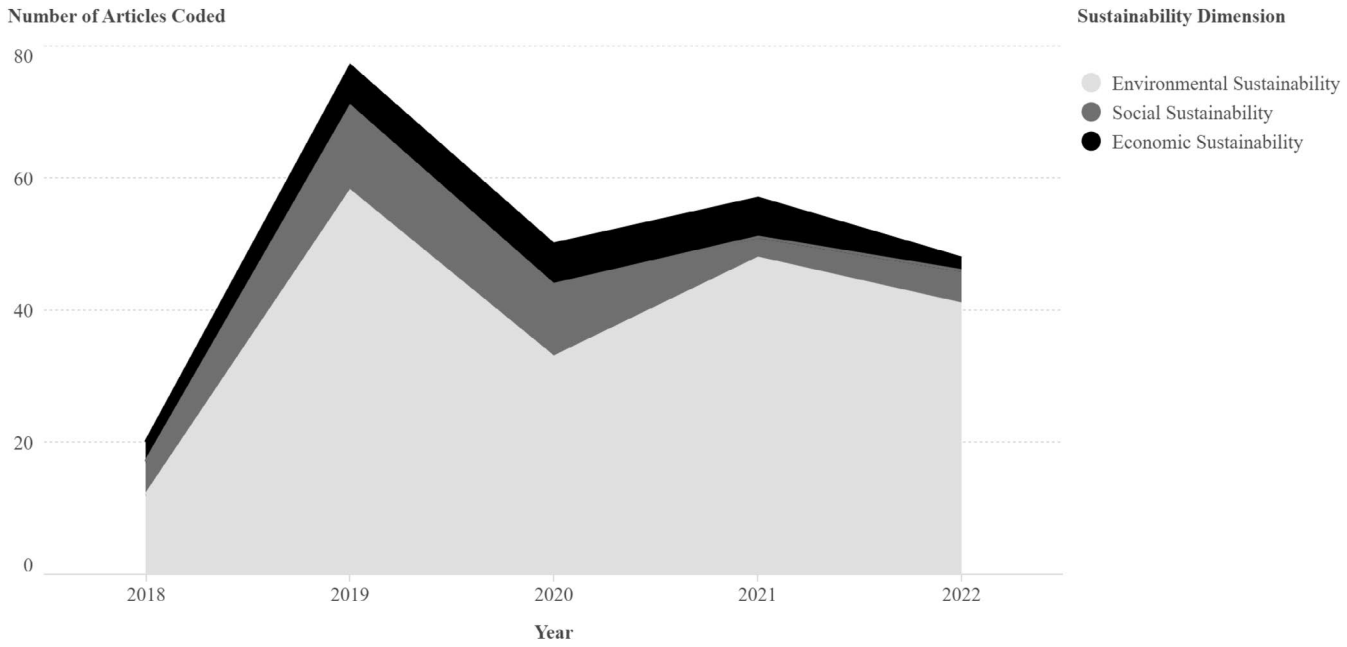

FIGURE 4 | Frequency of sustainability frames (primary/secondary) across sustainability pillars (by year).

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transition, and to prioritise sustainable farming systems, they have to take their chances in the marketplace—or leave farming to big global agri-businesses' (#583). Novel proteins raised concerns regarding economic equity, particularly with respect to ownership of these protein sources 'lab meat factories are likely to be owned and operated by big corporations like Nestle rather than the network of family or small businesses that are more common in traditional farming' (#1378). Indeed, disparities in access to resources across industry stakeholders and subsequent price pressures for farmers was noted as inhibiting farmers from investing in sustainable practices, as farmers 'are beholden to a handful of big corporations who set commodity prices, they have little leverage to implement more sustainable practices' (#642).

Regarding the social role of beef, farmers were oftentimes framed within their broader societal context, highlighting their roles in preserving heritage and community, acting as 'custodians of the countryside' (#33), boosting biodiversity and ensuring food security. Expectedly, narratives framing the benefits of beef often coincided with industry advocate viewpoints, with a 'one-size fits all' approach noted as lacking cultural sensitivity and reflecting a 'western-centric solution to the challenges of diet and climate' (#123).

4.4 | Beef, Health and Sensemaking—Reporting Ambiguity

Beef's role in human health was considered from the perspective of a range of dietary practices, spanning from 'traditional' (more meat intensive) diets, to 'adapted' (meat reduced) diets, through to meat free (plant-based) diets. Considering the framing of future diets, although there was a presence of both positive and negative framing of health messages, across reporting outlets these were not consistent within or between dietary patterns, with narratives providing both supporting and countervailing arguments for both traditional meat-based diets, reduced-meat diets and meat-free diets. In particular, health benefits associated with beef drew on narratives including nutritional completeness and nutrient density, health benefits for 'young children and women' (#146), and contextualising meat as part of '*balanced*' (#129) and '*varied*' (#61) diet. While some claims were substantiated through research 'Research suggests that the fat profile of grass-fed versus grain-fed beef is higher in healthy omega-3 fatty acids—important for brain and heart—and lower in fat overall gram-for-gram' (#164), others addressed health benefits in more general terms, without specific research claims or elaboration on beef's impact on key health markers.

Recognising the need for greater nuance and local solutions, global wellness was also cited as a limitation of restricting beef intake, given inadequacies in nutrient intake across regions 'Small amounts of meat, eggs and dairy in otherwise meagre diets can do wonders, helping to provide adequate iron, calcium and essential vitamins. Campaigns for global veganism may well have good intentions, but they often lack cultural sensitivity' (#991). Anecdotal evidence was frequently leveraged to highlight the benefits of both incorporating and removing meat from diets, with personal stories of health transformations arising from transitions back from low meat and meat free diets leveraged to highlight the health benefits of meat 'he wondered if meat might have an equally transformative effect on his health. "*I didn't realise how unhealthy I'd become until I became healthy again*"'(#1043). Additionally, framing of health benefits also drew attention to vulnerable populations such as young children, highlighting specific conditions such as anaemia which may develop in these populations.

Juxtaposing the health benefits of ruminant products and nutritional inadequacies on a global scale, limitations of a meat free diet were also contextualised in terms of limited acknowledgement of regional dietary, nutritional and cultural variations, when calling for balance 'in a world where around two billion people are currently nutrient deficient, consuming a few animal products can make a huge difference to health' (#1046). Tied to ideas of local production, concerns regarding quality of beef production practices associated with imported beef were also forwarded in support of national beef production 'With the potential threats of cheap inferior imports post-Brexit, such as hormone-treated beef, it is more important than ever for consumers to back British beef' (#634).

Highlighting tensions in advocate viewpoints, the planetary health diet was also cited by research advocates as having the potential to reduce mortality, while drawing attention to adverse consequences associated with meat consumption including linked diseases such as cancer and cardiovascular diseases. 'The Department of Health advises that we eat no more than 70 g (cooked weight) of red and processed meat a day, which is the average daily consumption in the UK. This is mainly because there is a link between bowel cancer and red meat' (#73).

Discourse regarding transitioning to meat reduced diets often encompassed consideration of PMBAs. Health was frequently cited as a reason for consumers' adoption of vegan or plant-based diet, with plant-based diets noted as being generally healthy, benefitting various non-communicable disease outcomes. '*Studies have shown plant-based diets have numerous health and environmental benefits. It can lower the risk of heart disease, strokes and type 2 diabetes, slow the progression of Alzheimer's and dementia, lower cholesterol, and lead to weight loss*' (#44). However, a vegan diet was also criticised due to nutritionally inadequate meat replacements, with PMBAs framed as highly processed, leading to adverse outcomes for human health and often containing high levels of undesirable ingredients such as salt. Similarly, some focus on vulnerable populations was evident in reporting, including citing research suggesting adverse impact of vegan diets on children's growth and concerns vegan parents may have regarding nutritional adequacy. 'Having to rely on supplementary tablets to sustain a vegan diet while attempting to maintain healthy levels of Vitamin B12, iron and vitamin D, doesn't exactly fill you with confidence that the vegan lifestyle is all it's cracked up to be. I know I would sooner my children source their vitamins and iron from a balanced diet of meat and vegetables, not tablets' (#147).

4.5 | Shifting Loci of Responsibility—Consumer and Value Chain Solutions

Among news articles identified as prognosticating, solutions across agrifood systems were contested. While the EAT-Lancet

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planetary health diet was often noted as theoretically reducing greenhouse gas emissions, its appropriateness, acceptability and feasibility remained contested. Pathways to ameliorating the adverse impact of beef ranged from changes at production level through to end consumers, with the overarching narrative identifying multiple actors with change responsibility. At farm level, regenerative farming practices were frequently cited as an intermediary solution, paving a path for beef as part of sustainable balanced diets by reducing environmental impact. While farm level solutions focused predominantly on sustainability, nomenclature typical of health narratives was leveraged in supporting production level changes, reflecting the emerging dual focus of beef reporting, casting large scale producers as using unhealthy inputs requiring an antidote '[regenerative farming is] billed as the antidote to monocultures, synthetic fertilisers, pesticides and a lack of cover ... Regen fans argue that cows aren't inherently bad for the environment. Industrial farming is the problem' (#698).

At market level, responsibility for dietary change was framed as shared across producers, retailers and consumers, with implications for dietary choice, including shopping locally from farmers markets, reducing individual meat consumption, eating seasonal produce, and reducing food waste. Sustainability benefits accruing from novel products, including lab-grown meats and plant-based meat substitutes, were argued, yet discourse concerning health implications was less clear. Equally, while improved farming practices through organic, high welfare and regenerative farming were proposed, concerns arose regarding affordability and 'elitist, middle class' (1043) connotations, highlighting the intersection of socioeconomics, diet and health outcomes and presenting challenges regarding marketplace inclusion. Aligned with the notion of a 'balanced' diet, it was also argued that high cost regenerative or sustainably farmed meat be considered a 'treat', used more judiciously within diets and culturally consistent with dietary practices of previous generations: 'regen produce is more expensive, but the added cost can be mitigated by viewing meat as a treat—as previous generations did' (#698). Various lines of inconsistencies emerged across sustainability and health narratives, in particular, relating to considerations of scale, production intensity, level of processing and where responsibility for provisioning sustainable diets ultimately lies. Various news articles highlighted shifts towards vegetarian diets owing to their affordability over meat, particularly during the cost-of-living crisis, with some advocating a vegan lifestyle arguing that the 'price of animal products is artificially reduced by the huge subsidies paid to prop up these industries' (#697). Given the varied solutions and stakeholders identified, narratives offered limited clarity in where responsibility lay within the food system more broadly.

5 | Discussion

Previous research has explored media framing of beef through an environmental lens (Mroz and Painter 2023). Building on this our study addresses media's portrayal of emergent tensions between human health, sustainability and dietary choice by moving beyond product acceptance to situate beef within its broader socio-cultural context. In a 'post-truth' era, meat's various dietary, nutritional, social and economic functions have led to meat becoming a malleable concept (Leroy et al. 2018), with its breadth of functions allowing it to align to and support disparate and potentially inconsistent discourses. This study builds on prior work, drawing specific attention to not only the tensions arising within lines of discussion and across media frames, but also the ways and means through which a variety of advocates' priorities and viewpoints are presented and forwarded through media discourse, bringing to light emergent solutions alongside areas of continued uncertainty. This is captured in our conceptual framework in Figure 5.

Although a wealth of literature highlights the tensions between sustainability dimensions (Ozanne et al. 2016), it is less clear how the representation of these tensions occurs within media reporting and the extent to which attempts to resolve these tensions (i.e., propose solutions) is evident in media reporting. Our framework highlights the range of tensions which emerge in reporting on beef's role in sustainable health diets. While the manifestation of these tensions is empirically drawn from the UK context, they have relevance beyond this, given the inherent tensions between sustainability and health goals and the market structures within which these tensions manifest. Of particular interest in this study is the means through which these tensions are potentially resolved in reporting. While some reporting incorporated a prognostic frame, the locus of responsibility and potential to resolve tensions varied significantly. In our analysis, we highlight individual consumer solutions, industry and policy solutions and reporting ambiguity where no clear solutions emerge.

In light of the above, our framework provides a scaffold of overarching tensions and reporting outcomes which merit consideration in framing sustainable healthy diet transitions. This framework is developed abductively within the UK reporting context, as such the specific institutions and actors influencing and informing tensions may vary regionally. For instance, in Nigeria, prior research highlights the importance of local informal actor networks in the meat sector (Osazuwa-Peters 2021), such that while tensions across actors have value in understanding issues influencing public interpretation of meat discourse, it is important to identify relevant advocates informing discourse. Equally, this framework offers a means to consider reporting variations across regions, recognising that, as evidenced by Sneyd et al.'s (2013) research exploring local and international media reporting on food riots across 14 African countries, framing can vary across international and local media interpretations.

5.1 | Uncertainty and Selectivity

Previous research has demonstrated that exposure to contradictory, inconsistent and value laden nutritional information can cause consumer confusion, backlash, and feelings of being bombarded, which influence behavioural intent (Clark et al. 2019). While the framing of meat in the context of climate change and sustainability has been explored (Almiron and Zoppeddu 2015; Palau-Sampio et al. 2022), this study adds to the international literature by considering the nexus of sustainability and health. In doing so we highlight how a shift towards sustainable healthy diet narratives presents potential to further compound existing consumer confusion, as the sustainable healthy

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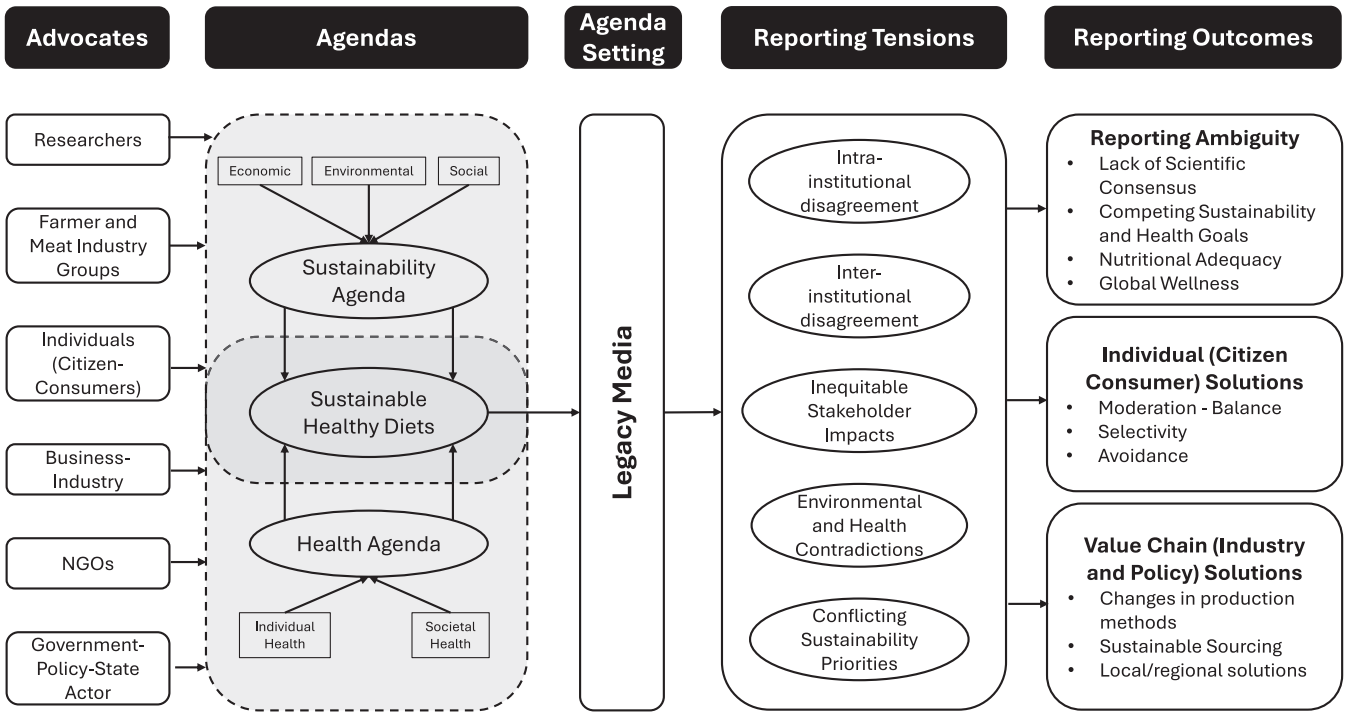

FIGURE 5 | Reporting tensions and solutions in sustainable health diet discourse.

diets concept is socialised against the backdrop of scientific uncertainty (Steenson and Buttriss 2020), as evidenced in this study. Uncertainty allows consumers to potentially select narratives which reinforce extant beliefs and dietary preferences or indeed disengage from reporting which lacks clarity. It is clear from reporting that the dual focus of health and sustainability has interjected further uncertainty regarding beef's role within Western diets, stemming from the presentation of a lack of scientific consensus regarding both the health and sustainability implications of traditional meat based and plant-based diets. Clare et al. (2022) highlight how lack of scientific consensus and health benefits are used as framing techniques by meat industry groups' communications to encourage continued meat consumption, our work adds to this, to evidence the presence of these frames within the broader legacy media discourse. Additionally, commensurate with work undertaken by Schüßler et al. (2024) analysing beef and dairy industry stakeholder media interviews in Germany, our analysis highlights shifting of responsibility between actors within the sector, potentially obscuring where change responsibility lies and consumers' role in change. Moving beyond the UK context, the findings of this study highlight the context specific nature of beef reduction discourse, in particular, the cognitive polyphasia literature underscores the importance of contextual understanding (Provencher 2011). As such, while common themes may exist in beef reduction discourse, it is necessary to understand how narratives unfold in other national contexts, to better inform policy responses by investigating how these multiple representations of beef are understood and utilised by consumers to inform dietary choice. Additionally, it is important to reflect local contexts, as for instance in their review of livestock production across African countries Balehegn et al. (2021) highlight variations in the efficiency of livestock as it relates to methane production, posing different regional challenges for livestock intensification pathways.

5.2 | Implications in a Fragmented Media Environment

Whereas this study focused exclusively on legacy media reporting, media consumption has fundamentally changed since the inception of frame analysis. Increasingly, news consumption is influenced by online intermediaries (e.g., social networks and search engines), allowing for algorithmic curation, which can impact both which consumers are exposed to reporting (Thorson et al. 2021) and the breadth of reporting they are exposed to. This change in media consumption is profound, with algorithmic exposure potentially leading to consumers engaging with increasingly narrow and ideologically consistent reporting outlets. The ideological heterogeneity of readership becomes even more relevant when considering the politicisation of diet, including meat reduction, given its socio-cultural, economic and individual relevance. Consequently, in an attention economy, wherein consumers seeking dietary choice information are exposed to a multitude (but not necessarily breadth) of information sources, consumer may not navigate the plethora of media outlets and associated viewpoints considered in this study, leading to more myopic understanding of beef's dietary and societal role. Findings presented point to the development of a complex, nuanced, multifaceted and value-laden narrative, which viewed in its entirety, paints a picture of a contentious consumption domain replete with tensions. As Happer and Wellesley (2019) note in their comparison of UK, US, China and Brazil, consumers' perceptions of sustainability are culturally specific and reflect national priorities, such that the efficacy of media reporting in influencing attitudes, behaviours and policy is inherently culturally bound and made more complex by the existence of frame plurality. Equally, our study highlights how viewing reporting subsets can uncover a less complex picture wherein evidence to support current dietary practices is readily available alongside

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information to rebut counterarguments for proposed changes. Consequently, the plurality of views both 'within' and 'between' reporting outlet becomes increasingly relevant when seeking to understand media's role in sensemaking and its ability to reinforce or challenge current beliefs, values and norms. While our analysis identifies multiple co-existing frames it is unclear to what extent individual consumers are exposed to conflicting frames, given variations in readership behaviour.

It must also be noted that in the context of dietary choice, legacy media acts as but one avenue for directly influencing behaviour change. While research supports the potential of information to stimulate dietary change (Bourke et al. 2024), suggesting that legacy media alone is sufficient to instigate and maintain dietary changes would be to ignore the preponderance of behaviour change literature. Nevertheless, as evident in our analysis, legacy media continues to have a significant gatekeeper role in disseminating information relevant to sustainable health diets from key stakeholders such as researchers, industry representatives and individual consumers among others. Consequently, legacy media may indirectly influence behaviour through multiple channels. Although this second level impact, and the adaptation and utilisation of legacy media reporting is beyond the scope of the current study, the potential impact of media through its agenda setting function is well documented (McCombs et al. 2014; Princen 2018). Equally, while media can shape opinions regarding dietary patterns, extant diet preferences may also shape the media which consumers engage (through personal preference or algorithmic curation), thereby reinforcing consumers' existing food choices.

5.3 | Solutions, Their Acceptability and Policy Implications

Although prior research has demonstrated conditions under which sustainable healthy diets can be more affordable (Goulding et al. 2020) across different socio-economic groups (Reynolds et al. 2019), consumer perception and reporting suggest scepticism regarding affordability of sustainable healthy diet transitions. Equally, there is increasing recognition that sustainable agrifood systems are likely to comprise a combination of solutions ranging from more balanced approaches, incorporating circular regenerative systems centred around a harmonious relationship with agrifood systems to more diversified solutions, comprising high-tech interventions, novel ingredients and product formats (Bord Bia 2023, 29). Prior research has highlighted that power asymmetries between meat industry stakeholders can shape the dissemination of ideas and knowledge, ultimately informing policy responses (Sievert et al. 2020). The acceptability of various policy interventions has been considered at length (Bryant et al. 2024), and in a UK context proposed interventions appear to be met with varying degrees of citizen-consumer acceptance, with tactics such as price increases and advertising bans poorly received (Pechey et al. 2022). Our analysis suggests that dietary solutions centred around balance, tradition, small-scale regenerative practices are emerging as key discussion lines from UK meat industry stakeholders, seeking to justify beef's role in sustainable healthy agrifood systems. These approaches are typically framed as providing a higher quality, small-scale, low volume product wherein beef has a continued, but potentially reduced role in diet. Yet, given the culturally bound nature of beef meanings, the efficacy of such narratives in other regions is unclear, particularly given regional variations in consumption levels and nutritional adequacy (McNeill and Van Elswyk 2012). As such, there is a need to understand the plurality of frames across regions and their applicability, as proposed dietary shifts may have significant but varied implications on nutritional adequacy and health, representing a marked departure form established dietary patterns across regions. Finally, despite calls for greater nuance in the context of regenerative farming practices (Rampalli et al. 2023), our analysis suggests growing recognition of arguments regarding nutritional completeness and bioavailability considerations pertaining to health.

6 | Conclusion

Ruminant agriculture's role in sustainable healthy diets will come under continued scrutiny both within academic and public discourse, with much uncertainty regarding how to best reconcile current agrifood system practices with pressing environmental and epidemiological challenges associated with greenhouse gases and non-communicable dietary diseases. While there have been significant advances in both the development and promotion of beef alternatives in recent decades, research suggests that current levels of beef production and consumption transcend planetary health boundaries (Willett et al. 2019). While proposals for radical changes within agrifood systems have been put forward, the spillover effects for industry stakeholders can be significant and their acceptability for both media actors and citizens cannot be assumed. While human health and environmental wellbeing continue to be central lines within the public discourse concerning beef, our research highlights a growing recognition of both the social and economic dimensions of sustainability, with proposed changes to ruminant agriculture systems drawing a sharp focus on the prospective impact of reduced beef production on local communities, food producers, quality of life, and food security more broadly. Equally, while much work has been undertaken to understand consumer acceptance of PBMAs from a sensory and conceptual perspective, concerns regarding ultra-processed food and naturalness perceptions raise consumer doubts, thereby impacting consumer choice within future agrifood systems. Considering the evolving health and sustainability narratives concerning beef, there is a clear need to understand consumer sensemaking against the backdrop of emerging reporting and implications for dietary practices.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Endnotes

[1] All media reporting cited in Section 4 pertain exclusively to news articles included in the analysis and serve as illustrative examples to support observations made. Exemplar news articles (indicated with a #) are provided in Supporting Information: Appendix A.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Data S1:** Appendix A: Articles included in analysis. Appendix B: Codebook. Please note that the coding scheme was adapted from the scheme developed by Di Gregorio et al. (2013).

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