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# Meat in the post-truth era: Mass media discourses on health and disease in the attention economy

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## ABSTRACT

The debate on meat's role in health and disease is a rowdy and dissonant one. This study uses the health section of the online version of *The Daily Mail* as a case study to carry out a quantitative and qualitative reflection on the related discourses in mass media during the first fifteen years of the 21st century. This period ranged from the fall-out of the bovine spongiform encephalopathy (BSE) crisis and its associated food safety anxieties, over the Atkins diet-craze in 2003 and the avian flu episode in 2007, to the highly influential publication of the report on colon cancer by the International Agency for Research on Cancer (IARC) in 2015. A variety of conflicting news items was discernible, whereby moments of crisis, depicting the potential hazards of meat eating, seemed to generate reassuring counter-reactions stressing the benefits of meat as a rich source of nutrients. In contrast, when the popularity of meat-rich diets was on the rise due to diets stressing the role of protein in weight control, several warnings were issued. Meat's long-standing and semiotic connotations of vitality, strength, and fertility were either confirmed, rejected or inverted. Often this was achieved through *scientification* or *medicalisation*, with references to nutritional studies. The holistic role of meat within human diets and health was thus mostly reduced to a focus on specific food components and isolated biological mechanisms. The narratives were often historic and displayed serious contradictions. Since several interests were at play, involving a variety of input from dieticians, (health) authorities, the food industry, vegan or vegetarian movements, and celebrities, the overall discourse was highly heterogeneous.

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## 1. Introduction

Science-based nutritional policymaking is in the eye of the storm (Fischler, 2013; Harcombe, 2017). Controversies reflect urgency, complexity, and paradigm uncertainty within the applied models (Freidberg, 2016), whereas mainstream dietary guidelines are being defied (Taubes, 2008). Erosion of centralized nutritional dogma parallels rising differences in the valuing of risk between social groups and between scientific communities, as well as a decreasing confidence in institutionalized expertise (Freidberg, 2016; Pollan, 2008). The debate is affected by varied agendas and

the rise of dietic individualism, mainly in Anglo-Saxon culture (Fischler, 2015). This evolution is not only post-modern but also *post-truth*, a term that first appeared in 1992, was declared “an era” in 2004, and became word of the year in 2016 (Keyes, 2004; Midgley, 2016). The scientific method has become subordinated to the amassing of information via cherry-picking, invention, and *bricolage*, provided that some coherence is present. According to Baggini (2017), Western societies may not be so much post-truth as “post-complexity”, with a need for articulate discourses in a disturbingly uncertain and contradictory setting, in which trust in authorities and unified expertise is historically low.

The case of meat eating is an exemplifying one. As an unquestioned health food, meat has been evoking strength and vitality to most cultures during most of their past (Leroy & Praet, 2015). Yet,

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its confident image became somewhat vulnerable to criticism in the 19th century, paralleling the rise of animal right movements and vegetarianism (Leroy & Praet, 2017), particularly in Britain, Germany, and the Netherlands. At the same time, reports on tainted or adulterated meat were being picked up by the public (Leroy & Degreef, 2015; Scholliers & Van den Eeckhout, 2011), sometimes leading to actual “meat panics” that initiated legislation (Olmstead & Rhode, 2015). More recently, such concerns have been amplified by a series of food crises involving contaminants and biohazards (e.g., Thévenot, Dernburg, & Vernozzy-Rozand, 2006; Boyd, Jardine, & Driedger, 2009). Yet, the crumbling of meat’s healthy image is not due to food safety issues only (Holm & Møhl, 2000). The advance of theories on the association between saturated fat and Western disease, especially cardiovascular pathologies, played a pivotal role since the 1950s (Keys et al., 1980). Recent reports linking meat to cardiometabolic diseases and colon cancer have greatly added to this (Bouvard et al., 2005; Micha et al., 2017).

In the slipstream of these developments, dietary guidelines are progressively depicting (red) meat and meat products as damaging to health, applying what is said to be “an evidence-based integrated message” (Wolk, 2017), although (discrete) warnings against too much meat consumption had emerged prior to 1914 (Scholliers, 2013; Scrinis, 2015). Obviously, evidence-based nutrition is not to be considered as static knowledge, being continuously shaped by novel, model-altering data (Baggini, 2017). Some authors, however, are seriously questioning the current consensus (Klurfeld, 2015; Leroy et al., 2018; McNeill, 2014; Taubes, 2008). Their critique generally focuses on the weaknesses of the epidemiological signals and the lack of clear causal associations. Turner and Lloyd (2017) have argued that the available studies either used excessive amounts of meat (components) or neglected the attenuating effects of wholesome diets. Remarkably, authors that take a convinced pro-meat stance generally rely on the same evidence-based methodology as their opponents, using it not only to criticize them but also to re-establish the *beneficial* role of meat in health (McNeill & Van Elswyk, 2012). Besides being confounded by the data ambiguity, scientific discourses on meat are also driven by dissimilar interests and opinions within the academic communities and their connected networks, i.e., industrialists, farmers, opinion makers, politicians, etc. (Ogle, 2013). This is reminiscent of the *science-in-action* concept, outlining the junction of conflict and interaction in the creation of scientific theory (Latour, 1987). Indeed, leading nutritional opinion tends to emerge via complex conformity-inducing social forces, agendas, and power gradients, rather than through an objective chain of proof (Baggini, 2017; Tierney, 2007). Herding or information cascades, for instance, induce researchers to abandon their own information in favour of inferences based on earlier actions of others (Easley & Kleinberg, 2010).

To sum up, the debate on meat’s role in health and disease is, since long, a rowdy and dissonant one, but became louder since the 1960s. The heterogeneity within the opinion is not entirely clear but is expected to be both influenced by and reflected in the mass media, increasingly through its online manifestations. The present study aims at portraying the health-related image of meat in public narratives by online mass media since the start of the 21st century. It thus spans the boisterous period between the end of the bovine spongiform encephalopathy (BSE) crisis and the bombshell report on colon cancer by the International Agency for Research on Cancer (IARC) in 2015. To our knowledge, this is the first study that aims at investigating the dynamics of the nutritional image of meat in the idiosyncratic settings of contemporary mass media, i.e., the post-truth era and the attention economy, both via a quantitative and qualitative (discourse) analysis. As such, it attempts at sketching and understanding one of the primordial societal matrices for both

the embedment and shaping of public food choices.

## 2. Materials and methods

Analysis of media representations of animal-derived foods has been applied previously to identify underlying societal sentiments and motivations, with respect to both health (Verriet & Leroy, 2017) and disease (Boyd et al., 2009), offering important insights even if this approach is acknowledged as not being a perfect reflection of views and beliefs. For instance, media coverage of cultured meat as a potential meat substitute was shown by Hopkins (2015) to generate a distorted reflection of public acceptance due to an overemphasis on the vegetarian segment.

In this study, mass media data were obtained by using a straightforward keyword-driven search (“meat”) in the dedicated “Health” category of the *MailOnline* (<http://www.dailymail.co.uk>) for 2001–2015, to cover the first fifteen years of the 21st century. This category contained redactional items only, sometimes also representing redacted testimonies from readers, and no advertisements. *MailOnline* represents the free online version of *The Daily Mail*, a printed newspaper published in the United Kingdom, including its sister edition *Mail on Sunday*. We have deliberately chosen this media source based on its specific creed and outreach. The newspaper’s political alignment is to be considered as conservative, having “Seriously Popular” as a typifying slogan. Although the limitations of this approach are acknowledged, the use of a single medium is both pragmatic and related to a need for focus. Also, *MailOnline* serves as an excellent case study, as its choice as source material was based on its societal relevance and wide reach, both printed and online. Whereas *The Daily Mail* has been the second most circulated newspaper in the UK for the period under investigation (between 1.7 and 2.5 million copies per day according to the Audit Bureau of Circulations; <https://www.abc.org.uk>), *MailOnline* became the most visited newspaper website in the world in 2011. In the same year, the online version obtained over 45 million unique visitors a month (Wheeler, 2012), increasing to almost 200 million unique visitors in 2014 (Edge, 2015).

A total dataset of 1310 news items was obtained, after control for relevance (i.e., excluding the articles centred on sensorial quality or other issues without an obvious health message) by careful individual analysis of each item. Items that were associating meat eating to health were categorized as “positive”, whereas the ones relating to disease were labelled as “negative”. In case both positive and negative aspects were present, the items were considered as “ambivalent”. Out of the 1310 relevant news items on the potential associations between meat eating and health or disease within the period 2001–2015, 224 items (17%) contained a direct reference to meat (products) or to meat abstention in the title (Supplemental material, Table S1). Both a quantitative and qualitative (discourse) analysis of the news items was carried out.

## 3. Results and discussion

### 3.1. Global quantitative analysis

In total, most of the 1310 items (52%) reported on connections to disease, whereas 35% of the items depicted meat as a health-promoting food. Only a minority (13%) mentioned both positive and negative aspects. In about half of the cases, the statements were backed up with a reference to either official health agencies and research institutions (24% of all items) or specific scientific studies (26%) (results not shown). The remaining items did not cite any specific references (18%), remained vague on their sources (14%), or referred to health opinionists without clear academic or governmental affiliation, such as naturopaths, food writers, and

midwives (18%).

When meat was portrayed as a health food, this usually was done by stressing its long-standing connotations of strength and vitality (Leroy & Praet, 2015). Through a process of *scientification* or *medicalisation*, often reducing meat's holistic value to one-sided discourses on singled-out nutrients and biological mechanisms (Gussow, 1981), this image was linked to energy generation, blood health, and endurance (in 13% of all items), uplifting effects on mood, brain function, and neural health (11%), growth and muscle-building (6%), reproductive health (6%), and the quality of skin, hair, and nails as health indicators (6%). Thus, meat was said to boost immunity and healing (8%) and to prevent a wide range of diseases (11%) (e.g., cancer, diabetes, osteoporosis, and cardiovascular pathologies). Also, its role in weight control was often mentioned (10%), due to its satiating protein content and being part of balanced diets. Advantageous meat constituents included iron (13%), vitamin B (8%), and zinc (6%), besides others (e.g., vitamin D, selenium, chrome, potassium, magnesium, sulphur, carnitine, creatine, factor Q10, and healthy fats), as also recurrently cited in academic literature (e.g., McNeill & Van Elswyk, 2012; Pereira & Vicente, 2013; McNeill, 2014).

With respect to disease, 20% and 17% of the total items referred to cancer and cardiovascular illness, respectively (cf., Abete, Romaguera, Vieira, Lopez de Munain, & Norat, 2014; Demeyer, Mertens, De Smet, & Ulens, 2016). Remarkably, these exact same pathologies were sometimes cited as being unaffected or even *prevented* by meat. Depending on the author, meat thus acted as a deterring, causative, or neutral agent in disease development. A parallel debate is found in the academics, where some authors come to the defence of meat (e.g., Klurfeld, 2015; Lippi, Mattiuzzi, & Sanchis-Gomar, 2015). Another concern was safety (12% of the items) due to pathogens (11%) and chemicals (6%), which meets contemporary fears of hazards and contamination, often intertwined with emotional responses (Olsen, Røssvoll, Langsrud, & Scholderer, 2014). Remaining anxieties related to weight gain (6%), neural disorders (6%), type 2 diabetes (4%), poor bone health (4%), and kidney damage (4%), besides more minor aspects (e.g., gout, allergies, skin and hair problems, poor immunity, poor libido and reproductive health, digestive problems, and an unpleasant smell). (Saturated) fat (13%), protein (4%), salt (4%), and haem iron (1%) were cited as the most problematic components.

### 3.2. Temporal quantitative analysis and trends

Except for a peak in 2002, the number of news displayed a gradual increase during the period 2005 to 2015 (Table 1). From 2001 to 2006, less than ten items per year explicitly referred to meat eating or abstention in the title (Table S1). Subsequently, the number of items with an explicit reference in the title varied from 11 to 17 (2007–2010) and from 18 to 31 (2011–2014), achieving 48 items in 2015. In the same time intervals, the fraction of news items referring to specific scientific studies and reports increased from 15% (2001–2006), over 27% (2007–2010), to 31% (2011–2015)

(results not shown).

During the first three years, the presented image was slightly more positive than negative (Table 1). This may have to do with a policy of reassurance after the BSE crisis, which had a major impact on the economy and risk perceptions (Muringai & Goddard, 2011). Several articles were launched to stress meat's health effects (Fig. 1a–c, e–i) and its content in iron, zinc, and vitamins (Fig. 3c–f). Contributions and columns by advisors (e.g., nutritionist Jane Clarke and food writer Linda Lazaridis) were included on a regular basis. The situation reverted after 2004, where the items mentioning a link with disease took the overhand. This was especially the case in 2015, due to the release of the IARC report on colon cancer (Fig. 2). Ambiguous items peaked during the Atkins hype (2003–2004), when journalists combined positive effects on weight control (Fig. 1d), based on protein content (Fig. 3b), with warnings for disease (Fig. 2b,c,e,f, i) due to too much fat and protein (Fig. 4a and b). Reports on food safety issues were dominant in the fall out of the BSE crisis (2001–2002), the wave of food contaminations in 2005, the avian flu crisis of 2007, and the several reports on meat-associated pathogens in 2015 (Figs. 2h and 4d). Periods characterized by negativity were at the same time typified by a surge of items stressing nutritional benefits, which seems to have been the case during the post-BSE crisis, the avian flu episode, and the IARC report (Figs. 1–4). In 2005, for instance, positive discourses focused on a need for meat and protein in balanced diets, often as lean meat in moderate amounts and in the context of school lunch boxes.

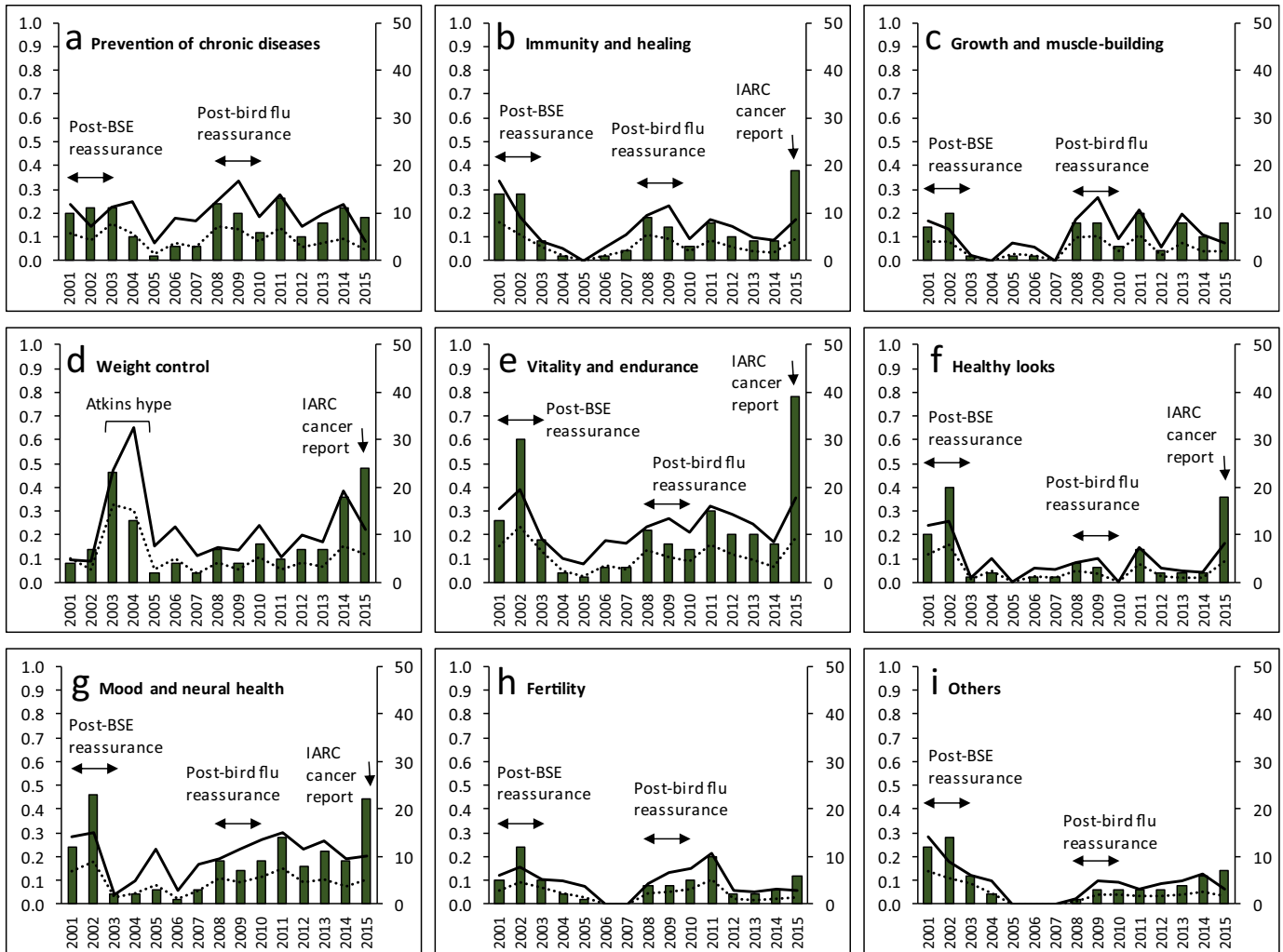
### 3.3. Discourse analysis: meat's role in health

Positive stances on meat chiefly addressed vitality and corporal health. In general, the human body was central to such narratives, whereby meat eating was hailed as superior for the sustainment of indicators of physical health. In “How your hair and nails reveal your health” (#31183), a connection between meat, iron, and keratin was advanced, which was rather grotesquely echoed in “I stopped my hair falling out by eating steak [...]” following a testimonial of a Tory politician (#3241163). Meat deprivation was said to lead to “unhappy, exhausted” bodies (#1113512), lower life quality (e.g., #2247968, #2143477, and #2596012), bad skin and circles under the eyes (e.g., #2323976), hair loss (#329006), crumbling teeth (e.g., #3076582 and #3217040), anaemia (e.g., #2017514), suboptimal development in children (e.g., #1028854, #112207, and #338569), and problematic mental states such as depression and anxiety (e.g., #2118409, #2409255, and #2862197). Vegetarianism was labelled as “just a phase” (#2862197), advocating the *normality* of meat-eating (Piazza et al., 2015), whereas vegans were presented as fatigued weaklings due to nutrient deficiencies (#67440), thus heading towards premature death (#178767). In another item, vegans were signified as vulnerable to infections because of a lack of protein, whereby not only meat eating but also love making was said to boost immunity (#405842). Entwining of meat, vitality, and sexual health was noticeably present in “Eating McDonald's gave me TRIPLETS! Vegetarian who was

**Table 1**

Percent representation of the number of news items relating to associations between meat-eating and health (“positive”), disease (“negative”), or both (“ambivalent”) on the total amount of relevant news items for the period 2001–2015 in the *MailOnline*.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Positive (%)	41	49	43	26	22	34	24	42	29	34	34	28	30	27	39
Negative (%)	51	40	30	53	65	59	67	43	61	57	50	60	62	61	47
Ambivalent (%)	8	11	27	21	13	7	9	15	10	9	16	12	8	12	14
Total	86	128	70	43	37	41	54	83	76	77	94	87	107	120	207



**Fig. 1.** Overview of the news items relating to the positive health aspects of meat-eating for the period 2001–2015 in the *MailOnline*, including (a) the protection against Western diseases (i.e., cancer, diabetes, osteoporosis, and cardiovascular disease), (b) immunity and healing, (c) growth and muscle-building, (d) weight control and satiety, (e) vitality, blood health, and endurance, (f) healthy skin, hair, and nails, (g) brain, mood, and neural health, (h) reproductive health and fertility, and (i) others. Dashed and full lines indicate, respectively, the yearly ratio of representation of each positive aspect on the total and on the positive-plus-ambivalent number of news items (left axis); bars indicate the yearly number of news items related to each positive aspect (right axis).

told she would never have children gives birth to three babies after turning to a daily diet of meat” (#2408779). Changes of conception were said to depend on nutrients such as selenium and iron (e.g., #57808, #2839367, #312493, and #2998851). Also, several fertility references had masculine overtones (Table 2).

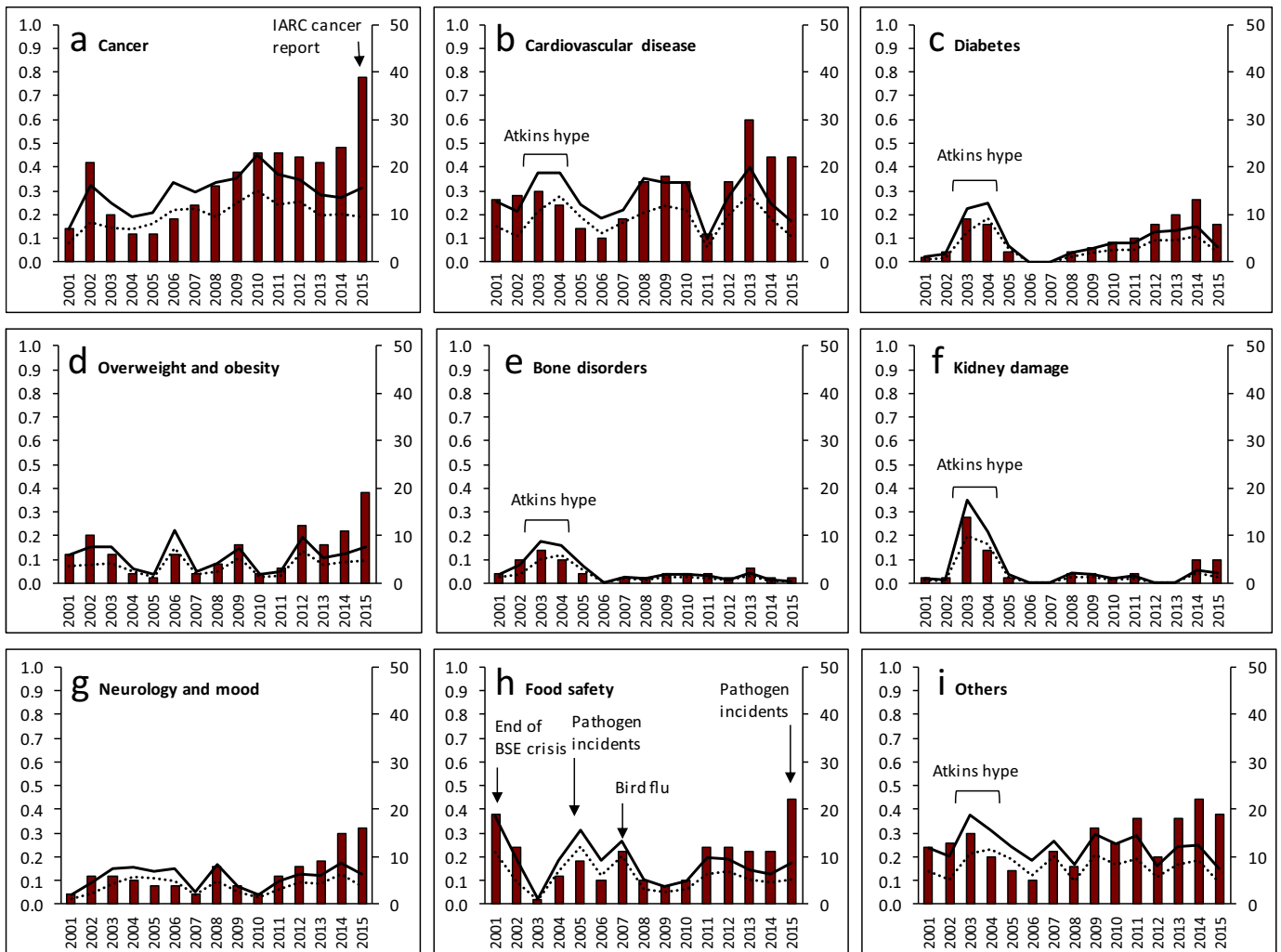
Although meat was essentially linked to vitality by referring to the physiology of its specific nutrients (e.g., #1370939, #2253251, #2947717, and #2947734), there was also a striking match with its more intangible yet deep-seated symbolism of strength, fertility, and masculinity (Leroy & Praet, 2015). While metaphorical entrenching was mostly implicit, i.e., connecting nutrients to biological functions, the ultimate conclusions described direct effects on blood, libido, and muscle. The latter are not only rather explicit but also historic connotations of meat eating. This congruence may not be trivial. According to Lakoff and Johnson (1980), metaphors are key in the negotiation of meaning. Whether they also act as a primary mechanism for the structuring of the scientific “truth” about meat, based on “imaginative rationality”, requires further investigation. In this context, it may be worth exploring if the use of conservative and patriarchal metaphors for meat serves as a conceptual framework for the defence of traditional ideas about diets

(“normality”) against emerging challenges, in line with the *mythology* of the French steak proposed by Barthes (1957).

### 3.4. Discourse analysis: meat's role in disease

In high-income countries, a transition towards reduced meat consumption is taking place (Mathijs, 2015). The connections with ecological concerns (Sabaté & Soret, 2014), ideological views on animal rights and their killing (Leroy & Praet, 2017), as well as the dietary anxieties of the human omnivore (Lecerf, 2015) are problematic to many. Although these aspects likely intertwine to some degree, direct references to animal welfare and the environment were rather infrequently encountered in this present study (for some exceptions, see #2201458, #2226420, #2237258, and #2900333). Most of the focus of the *MailOnline*'s Health section was thus directly on human health and disease.

In the first ten years of the investigated period, warnings for disease associations were usually moderate, as in “Red meat can ‘raise cancer risk’” (#375789) and “Eating too much red meat ‘is bad for the heart’” (#509928). Later, the headlines often became more inflated, as in “How eating red meat could trigger a STROKE:



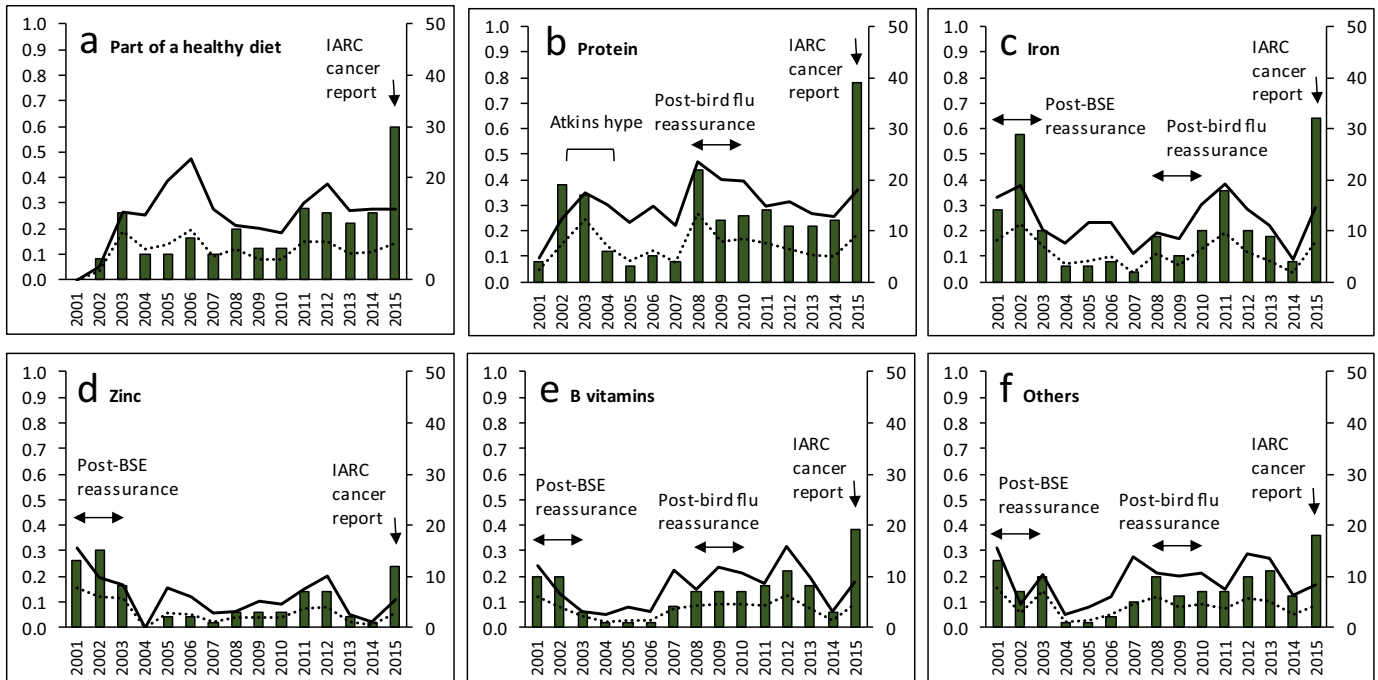
**Fig. 2.** Overview of the news items relating to the negative health aspects of meat-eating for the period 2001–2015 in the *MailOnline*, including (a) cancer, (b) cardiovascular disease, (c) diabetes, (d) overweight and obesity, (e) poor bone health and osteoporosis, (f) kidney damage, (g) brain, mood, and neural disorders, (h) (bio)hazards and food safety, and (i) others. Dashed and full lines indicate, respectively, the yearly ratio of representation of each negative aspect on the total and on the negative-plus-ambivalent number of news items (left axis); bars indicate the yearly number of news items related to each negative aspect (right axis).

Gorging on steak, bacon and sausages 'means you're 50% more likely to life-threatening blockage in the brain' (#3335328), putting processed meat at the "same level as cigarettes" (#3289821) and condemning a mere "two rashers of bacon a day" (#3289821) and "one steak a week" (#3299655) as potentially deadly. To be fair, some news items maintained a less spectacular tone. For instance, in "Would YOU become a semi-vegetarian? [...]" (#2981207), it was suggested to only partially substitute meat with plants, instead of a "drastic avoidance".

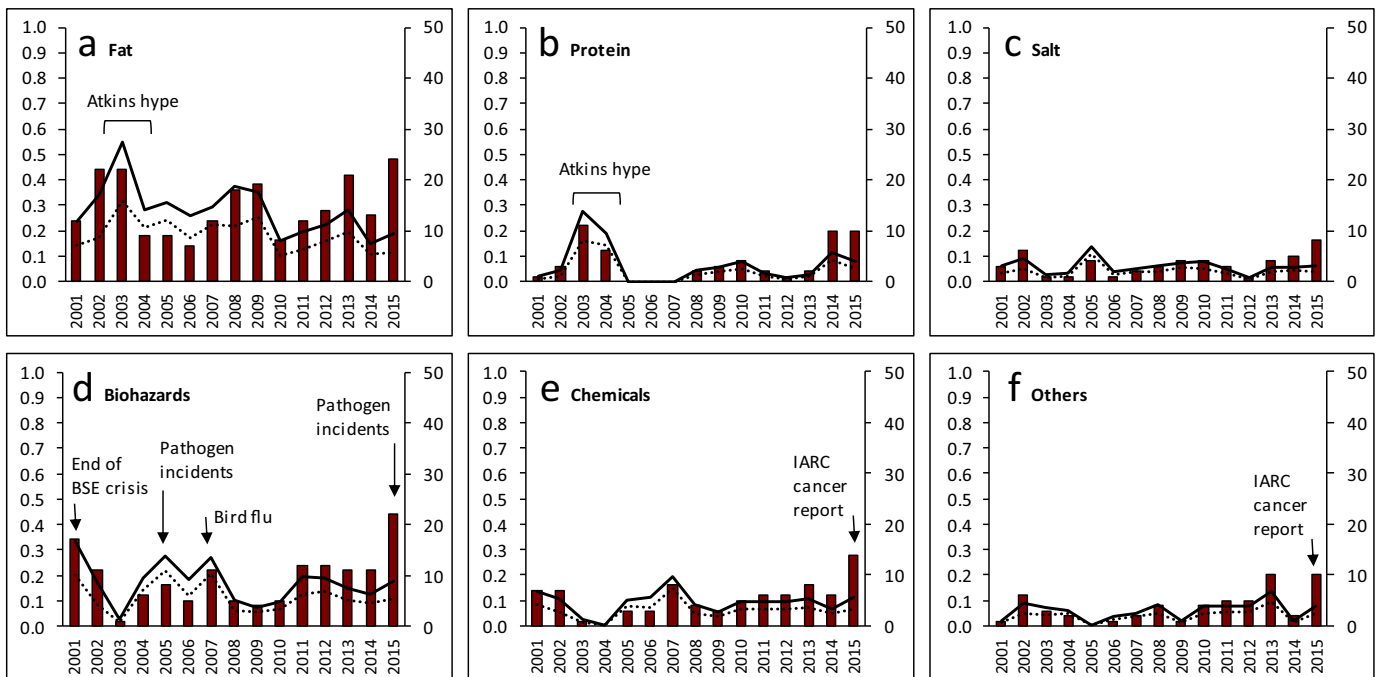
Similarly increasing sensationalism was found for food safety warnings, ranging from the restrained "How stuffing the turkey can be a recipe for food poisoning" (#151948) in 2002 to the explicit "How turkey covers your kitchen in BUGS [...]" (#3359946) and "75% of fresh chickens sold in supermarkets carry deadly food poisoning bug [...]" (#3325478) in 2015. Although post-BSE, worries about the mad cow disease occasionally flared up (e.g., #51728 and #142241), voicing concerns over hidden cases in the population (#381135 and #2055904). In 2005, the first alarm about avian flu appeared in "No turkey for dinner this Christmas?" (#366940), which was amplified during the actual crisis in 2007 (e.g., #435109, #433896, and #434167). Safety hazards also included chemicals, hormones, and antibiotics. In "Why it was

EASIER to be thin in the 1980s [...]", the latter two were blamed for the weight gain of millennials due to interference with gut bacteria (#3257331).

Part of the negative portrayal of meat beleaguered the same premises that construct its aura of normality and vitality. It was argued that meat causes early death (e.g., #2249571 and #2310053), depression and fatigue (e.g., #2321348, #2423492, and #2480011), and harms sexual health (e.g., #323693, #1192483, #2064240, #2460072, and #3192352). Concerning the latter, titles ranged from a cautious "Sunday roasts 'could have hit male fertility'" (#445034) to the hyperbolic "Why feasting on steak makes it difficult for men to father a child (it makes their sperm slow)" (#1192331). Meat-derived ammonia and blood acidity were accused of, respectively, halting implantation in the uterus (#312494) and lowering sperm activity (#312494). Additional factors included the disruption of cell functions by saturated fat (#124003), interference by oestrogen-like compounds (#2396180), and more diffuse toxicities (#312482). An animal rights charity claimed that vegetarians not only have a better sex life but are also "fitter and slimmer" (#2226420 and #2237258). In disparity with the view that meat eating is *normal, necessary, and natural* (Piazza et al., 2015), the presence in beef, pork, and lamb of "a chemical that



**Fig. 3.** Overview of the news items relating to the contributing factors explaining the positive health aspects of meat-eating for the period 2001–2015 in the *MailOnline*, including (a) the being part of a healthy or balanced diet, the presence of (b) protein, (c) iron, (d) zinc, and (e) B vitamins, and (f) others. Dashed and full lines indicate, respectively, the yearly ratio of representation of each factor on the total and on the positive-plus-ambivalent number of news items (left axis); bars indicate the yearly number of news items related to each factor (right axis).



**Fig. 4.** Overview of the news items relating to the contributing factors explaining the negative health aspects of meat-eating for the period 2001–2015 in the *MailOnline*, including the presence of (a) fat, (b) protein, (c) salt, (d) biohazards, (e) chemicals, and (f) others. Dashed and full lines indicate, respectively, the yearly ratio of representation of each factor on the total and on the negative-plus-ambivalent number of news items (left axis); bars indicate the yearly number of news items related to each factor (right axis).

is unnatural to the human body” was highlighted (#2890243). A pernicious link between masculinity, meat-eating, and overweight was echoed in “Why are men getting so tubby?” (#1343822). Finally, one item stated that eating meat from the bone incites aggression in kids, rerouting the vitality element towards a more

excessive variant (#2728294).

In light of the above, it is not uncommon for vegetarian strategies to undermine the positive symbolism of meat, while elaborating on its potential harmfulness. *Zaraska (2016)*, for instance, does not only state that meat avoidance would have us “spend less

**Table 2**

Overview of some selected, representative news items underlining the beneficial role of meat (products) in health.

Date	Article	Headline
Meat as a promotor of vitality		
17/03/2003	#172173	Feeling tired? Eat meat!
23/08/2008	#1048551	The good fuel guide: What to eat to keep you sporting fit
07/07/2015	#3152443	How a juicy steak and an ice cream can stave off frailty in the elderly: Nutrient found in meat and dairy improves stamina
Meat as a promotor of (male) fertility		
01/08/2009	#1203639	Beef up your zinc levels - and give your fertility a boost
20/10/2014	#2799519	A pint of beer a day 'can double men's fertility': But coffee and being vegetarian cuts odds of conceiving
10/02/2015	#2947734	How a man can EAT his way to healthier sperm: Steak, eggs and watermelon help make strong and virile semen, book claims

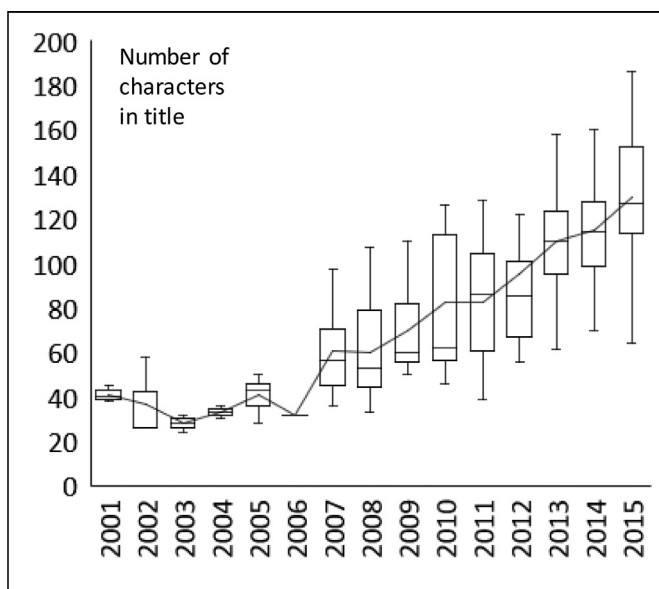
time on the toilet [...] and live longer”, but also stresses the importance of celebrity endorsement and the need to enhance the prestige, vitality, and masculinity of meat substitutes (*i.e.*, plant-based products or cultured meat). The latter should not only replace the taste and nutritional value of meat but also “all the symbolism that it carries”. Role models supporting the benefits of meat reduction were indeed repeatedly referred to (*e.g.*, #54615, #57963, #137626, #371528, #1303649, and #2274086). Yet, some celebrities were accused of propagating orthorexia and other eating disorders in female teens (*e.g.*, #198217 and #3217040), whereas others actively promoted meat (*e.g.*, #352059).

### 3.5. Discourse analysis: sensationalism, reassurance, and contradiction

Discourses on meat intensified over the years. This is reflected in the rise in the yearly number of news items, the number of items with an explicit title, and in the length and sensational tone of the titles (Table 1 and Table S1; Fig. 5). Prudent titles from the first three years, often using question marks and conditional tense, *e.g.*, “Meat or vegetarian: which is best for you?” (#32381), “How healthy is your roast?” (#104022), and “Are sausages good for you?” (#109060), contrasted with the later brazen and - indeed - post-factual headlines, such as “Eat bacon, don't jog and NEVER eat

fruit: Health guru reveals the 10 surprising ways YOU can shed the pounds and get fit” (#3276215). The sensational penchant of the newspaper, whereby isolated and minor studies are applied to produce scare stories, has been heavily criticized by journalists, academics, and health professionals (Bishop, 2012; Butterworth, 2012; Goldacre, 2010). Cacophonous mediatisation and unrestrained nutritionism (Scrinis, 2015), ahead of academic validation, not only cause disinformation but also threaten public health (Fischler, 2013). The *MailOnline* itself reflects this by bringing stories on people that venture into hazardous diets, as documented by the case of a woman trying to beat breast cancer with vitamins rather than chemotherapy (#2968329). On a less perilous level, meat was portrayed as a cure for hangovers due to its richness in cysteine “which is thought to help clear out toxins” (#372318). Although the newspaper referred extensively to all sorts of experts, from fitness gurus (*e.g.*, #168263) to leading nutritionists (*e.g.*, #566721), the scientific authority of the sources used in the most sensational items was often obscure. This was the case when some “Food Doctor Diet” linked red meat to “a substance called galanin, which leaves us craving even more fatty foods” (#204086). At times, folk science was thrown in, for instance relating diets high in meat to the Bo-Shin concept of “Sanpaku” (#156166). Another bizarre item suggested that such diets also yield a goat-like body odour, as the one noticeable in meat-indulging Scottish communities (#13049).

In contrast, some journalists used a calmer and reassuring tone, especially in times of crisis. This is not unexpected as the media genre in question is predisposed to come up with counter-current information to generate newsworthiness. In some but not all of the cases, these communications were backed up by studies or experts with overwhelming credentials, as was the case for Roger Leicester acting as “Director of Endoscopy at St George's Hospital and director of the SW London Bowel Cancer Screening Programme” as well as a “former secretary of the British Society of Gastroenterology”, who described meat as a “scapegoat” and warned for iron deficiency upon abstention (#3291561). Jane Clarke, one of *MailOnline's* main nutritional consultants, intervened every so often to restore confidence in the healthiness of meat (*e.g.*, #1020505, #1015944, #1028833, #1056326, #1077359, #1089057, #1113512, and #1134413). Other journalists similarly conveyed reassuring messages, often in the aftermath of reports on cardiovascular disease and cancer (Table 3). Relativizing opinion pointed, for instance, at the misinterpretation of risk and the fact that “one way to avoid cancer would be to stop eating or drinking anything, but the unfortunate side-effect would be death” (#3298459). The IARC report was criticized as - according to the same logic - one could no longer “breathe air (Class I carcinogen), sit near a sun-filled window (Class I), drink coffee [or] eat grilled food (Class 2A), or apply aloe vera (Class 2B)” (#3285490), thereby putting “working as a hair dresser [...] in the same category as red meat” (#3289821).



**Fig. 5.** Increasing sensationalism as reflected in the number of characters counted within the titles of those news items that directly refer to meat (products) or abstinence thereof (vegetarianism or veganism), represented per year. For a full overview of these titles see Supplemental Material (Table S1).



**Table 3**

Overview of some selected, representative news items downplaying the role of meat (products) in disease.

Date	Article	Headline
30/07/2002	#130635	Unravelling the cancer myths
15/09/2008	#1056326	Don't feel guilty about eating meat
13/10/2008	#1077359	Jane Clarke: You shouldn't always listen to nutritionists!
24/11/2008	#1089057	Jane Clarke: Forget reading the label - just enjoy your food
04/03/2013	#2288088	After all those warnings about saturated fat being unhealthy for hearts ... Stop feeling guilty! That juicy steak is good for you
08/03/2013	#2289946	I'll carry on eating bangers, says industry's biggest critic, who rubbishes claims that processed meats could kill us providing they are eaten in moderation
30/03/2013	#2301577	Sausages ARE safe after all: Relax about the recent scare - unless you've eaten one banger a day for your whole life!
22/10/2015	#3284505	Forget red meat - you're more likely to get bowel cancer from eating CHOCOLATE: Leading colorectal surgeon on why he eats meat regularly - and how sugar is the true culprit
31/10/2015	#3298157	A disgraceful scare story - so don't bin your bacon sarnies: One nutritionist questions the claims made by the World Health Organisation after it declared war on red and processed meat
31/10/2015	#3298459	To use the scientific term ... it's cobblers! If you're consuming enough bacon to make it as dangerous as tobacco, then cancer is the least of your worries, says MICHAEL HANLON
02/11/2015	#3300942	Why red meat can be GOOD for your health: After days of dire cancer warnings, take comfort in this expert analysis

Nutritional advice was often blatantly inconsistent. Meat was for instance said to both prevent and cause macular degeneration, via zinc and omega-6 fatty acids, respectively (#2133222). Saturated meat fat was usually portrayed as harmful for cardiovascular health (e.g., #129580, #308975, and #1079176), at some point rehabilitated (#2274747, #2765715, and #3194376), and subsequently reconvicted (#3252228). This was also reflected in the discussion on whether the fat-loaded, bacon-and-egg-style British breakfast is a healthy one (#1263778, #1276881, and #2844943) or not (#1049142). Uncertainty stems from academic uncertainty, partially due to imperfect assessment methods and the poor quality of the evidence (O'Sullivan, Hafekost, Mitrou, & Lawrence, 2013; Harcombe, 2017), which leads some authors to dismiss an exaggerated focus on nutrients instead of meals (Dildy, 2015). Not unlike Pollan (2008) and Fischler (2013), some of the items advocated the virtues of diets of the 1950s rather than the hyping or exclusion of specific foods (e.g., #153524). Authorities were aligned with this approach, with the Government's eating guidelines defending the traditional approach to meat in school restaurants (#154998). Although still very reductionist, some journalists argued that meat's impact on disease should not be isolated from the counteracting effects of other dietary compounds in the diet, such as wine (#2262222), yoghurt and ketchup (#1359352), apples (#2136661), certain plants (e.g., #3253546, #2518129, #1364046, #2100750, and #2130642), or food supplements (#2697986). This point of view was nevertheless once again contradicted by others, as in "Eating too much meat 'raises risk of diabetes' even if they eat lots of fruit and vegetables too" (#2501852). In general, a large assortment of food components was inserted into the narratives, being contextualized by either conventional or alternative experts, offering incompatible advice. If one must eat "scientifically", expert guidance indeed becomes indispensable (Pollan, 2008).

To further increase disparity, contradictory discourses also involved differences in agendas and intervention of pressure groups. Some articles could be ascribed to vegetarian or vegan ideology (e.g., #472033, #2237258, and #2732573), whereas in others economic interests by the meat industry was discernible (e.g., #3329823). In one item, a furious sausage maker voiced his intention to sue the United Nations, with the backing of a former Environment Secretary, "because British bangers DON'T contain the same dangerous chemicals as those made in Europe" (#3313184). Also, a study by Norat et al. (2005) on the link between red meat and cancer was contrasted with protest from the Meat and Livestock Commission, saying that people in Britain eat meat well below the level of concern and within balanced diets (#352339). As

discussed below, the controversy surrounding the Atkins diet forms a good example of a discourse shaped by a lack of central nutritional authority and a variety of voices and antagonistic agendas. For a further elaboration on the intensity and complexity of the interactions between nutritionists, the meat industry, health authorities, anti-meat lobbies, the media, and the public, we refer the reader to the exhaustive study by Ogle (2013).

### 3.6. Discourse analysis: the Atkins hype as a typifying case of conflicting interests

In 2003–2004, the Atkins diet emerged as a food hype and, therefore, a point of attention for the *MailOnline*. The diet has been very controversial, also academically (e.g., Astrup, Meinert Larsen, & Harper, 2004; Lean & Lara, 2004). Several items addressed its potentially negative impact due to protein augmentation and carbohydrate restriction, while admitting its success with respect to weight control (e.g., #188550). The magnitude of the hype even led to the formation of a dedicated section (e.g., #194546, #194561, and #195463). Cited health professionals mostly discredited the diet, for instance as a "massive health risk based on pseudo-science" (#193081). It was connected to an impressive range of pathologies, including heart disease, breast cancer, gout, muscle weakness, halitosis, osteoporosis, asthma, kidney damage, and constipation (e.g., #194546). This resulted in threatening titles, such as "Watchdog: 'Atkins can kill'" (#196988), "Atkins left me with agonising cramps" (#197287), "Atkins danger in pregnancy" (#200850), and "Atkins could stress unborn babies" (#344528). The diet was also said to generate "emotional zombies", by referring to a lack of serotonin production, the body's "happy hormone" (#299649). Such fierce attacks were nevertheless being downplayed by other news items, such as "Calorie bonus for Atkins dieters" (#199745) and "Atkins dangers 'exaggerated'" (#199563). In the latter news item, the chairman of the National Obesity Forum depicted some of his colleagues as "stuck in their thinking that fat is bad and carbohydrates are good" and reacting "on the basis of what they fear is going to happen rather than what is actually happening". The credentials of Professor Peto, from the Institute of Cancer Research, were used in "Atkins recommended for obese children" (#299896), whereas a study by Romieu, Lazcano-Ponce, Sanchez-Zamorano, Willett, and Hernandez-Avila (2004) formed the basis for "Atkins could cut risk of breast cancer" (#313333).

The controversy was fed by economic entanglements. Opponents included spokesmen of the British Potato Council, being cornered by the low-carb messages of the diet. In "Spuds are 'good

for slimming” (#187980), the Council criticized the hype as a feasting “on liberal amounts of fat and protein-filled meat”, being backed therein by a nutritionist which labelled the diet as a “fad”. The motives behind the critique by the potato lobby were obviously largely economic as it was “worried there could be a long-term effect on sales if the interest in faddy diets continues” in an industry “worth about £65 billion”. In “Chips are down due to Atkins” (#197961), the diet was said to be “bad news for producers of potatoes, rice and pasta”, whereby the National Fish Fryers Association urged “the British public to get behind traditional food and keep supporting their local fryers” instead of falling for a “short-lived diet fad.” Such economically driven reactions are comprehensible, as the diet has indeed “been blamed for a slump in sales of pasta, potatoes and rival slimming products” (#194382). On its turn, the Potato Council was counterattacked for being “desperate to reverse downward sales [and having] invested £1 million in a promotional campaign” (#192394) in a news item referring to a “relentless hostility” and “unprecedented whispering campaign”. The latter item was also slamming the “big guns” of the Human Nutrition Research Centre in Cambridge for being prejudiced in their critique towards the diet, stating that “It’s easy to be sceptical when commercial motives are at work.” On the other side of the economic spectrum, Atkins Nutritionals joined the media debate as an industry making “more than £65million a year from books and diet products”. The company was given a platform to reassure the audience that the diet will be optimised to meet concerns related to fat intake (#206189). To counter accusation of pseudo-science, the Atkins Medical Information Services presented the diet as a “nutritional programme rooted in science”, (#207830). Finally, in “Low carbs diet could slim beer bellies” (#326154), a financial pro-Atkins interest was evoked by stating that a study on the positive effect of the diet on weight loss (Volek et al., 2004) “was partly funded by the Robert C. Atkins Foundation”.

Celebrities were prominent in the controversy, by either endorsing or opposing the diet for reasons of slimming, health, or ideology (e.g., #195448 and #3132675). In the article “Should you eat fat to get slim?” (#189484), a vegetarian TV personality raged that the diet is “a recipe for a revolting feeling of bloated over-consumption, coupled with a disgusting, fatty taste in your mouth and breath like vapours from a compost heap”. Ideological motives were suggested in “Dr Atkins: 18st when he died” (#207828), where the founder of the diet was said to have died from cardiovascular disease by a group of “vegetarian doctors who leaked the report [on his death]”. Moreover, his widow counter-acted by stating that she had been assured by physicians that her husband’s health problems were “completely unrelated to his diet or any diet” and that “it is deplorable that unscrupulous individuals should try to use his history of heart disease to discredit his ideas about healthy eating”.

Eventually, both the negative and positive facets of the diet were picked up by the public. In March 2004, some 80% believed the diet to be harmful after “months of negative publicity with scientists linking the regime to [medical] conditions”, although the majority – especially women – was still convinced it works and prepared to take a risk (#230009). Yet, “Britain’s love affair with the Atkins diet” ended with the closing of the British subsidiary of the Atkins corporation in 2005 (#341537). Occasional pro-Atkins articles nevertheless kept on appearing during the subsequent years (e.g., #403742). Taken together, the Atkins episode illustrates how certain diets can rapidly become coveted and then stigmatised as a “fad” when transiently entering the myth of the miraculous “healthy diet” (Lecerf, 2015). Similar examples include the raw-food and Paleo diets (e.g., #3217040), the Zone diet (e.g., #202241), and the bone-broth craze (#3096239).

### 3.7. The attention economy as a matrix for sensationalism

The results of this study show that the *MailOnline*’s nutritional content is often sensationalized and, thus, subjected to the laws of the “attention economy”, where the most valued content is that which is likely to attract attention (Marwick & Lewis, 2017). The information overload enabled by the internet makes attention a prime resource, as page views determine advertising revenue (Goldhaber, 1997). This source of income has become all the more important for online publishers as their traditional business model has crumbled due to the unwillingness of internet users to pay for subscription fees. In an information-saturated world, media seek to cover whatever can attract “eyeballs” (Nordenson, 2008; Wu, 2016). A regularly used technique is posting “clickbaits”, which refers to sensationalist and sometimes misleading headlines designed to increase article views (Hamblin, 2014). Thus, clicks, shares, likes and comments are carefully monitored, even by traditional news outlets. They even tailor future content to drive up their metrics, incentivizing high-performing low-quality posts over high-quality journalism (Chu, 2016). Due to the personnel cuts and a constant need for novelty to fill up a 24/7/365 news cycle, this has led to less fact-checking and investigative reporting (Karlsson, 2011; Starr, 2009, 2012). Fuelled by the need to constantly produce news content that will lead to the greatest number of clicks with limited resources, reporters are drawn to content that is novel, sensational, or emotional (Fengler & Ruß-Mohl, 2008). Unsurprisingly, this leads to a higher coverage of such items, which is one of the hazardous effects of the increasing commercialization of journalism (cf. Bagdikian, 2004). This can explain the media frenzies across Europe over the ‘mad cow disease’ a few years ago, which has led to over-exposure and economic damage (Kepplinger, 2001). Marwick and Lewis (2017) even warn for outright disinformation and manipulation by political or social activists or by less ethical PR agencies or ‘spin doctors’ for marketing purposes. The spread of dis- and misinformation circulating online and in the media, also coined “fake news”, has major consequences. It has a negative effect on public trust in the media, which is already at an all-time low, and is responsible for a declining consumption of news and the prevention of future access to accurate information (Barthel, Mitchell, & Holcomb, 2016). Even when misinformation is debunked, it continues to shape people’s attitudes (Thorson, 2016).

## 4. Conclusion

Meat has been represented in mass media as a flexible concept, being at the disposition of several agendas. This is not new, and certainly since the late 19th century the qualities of meat have been highly debated. As a predilected study object for nutritional research, a commodity with high economic value, a potential environmental pollutant, a symbol of oppression and violence, and – foremost – a desirable food with strong cultural connotations, meat functions as a potent signifier. Yet, according to the results of the present study, the specific conditions of the post-truth era and the attention economy seem to further amplify these effects and speed up the overall dynamics. In the absence of a Grand Narrative, a variety of discourses by scientific experts, industrial spokesmen, celebrities, opinion makers, food writers, health gurus, and ordinary members of the public was shown to lead to an overwhelmingly incoherent and contradictory corpus. To which degree this has led to measurable and quantifiable heterogeneity of opinion, collective confusion and/or strengthening of scientification, altered dietary practices, and health effects within the newspaper’s audience, needs further investigation. It may be particularly interesting also to evaluate how all this interferes not only with meat eating but also with the acceptance of *in vitro* meat and other

meat analogues by both the general public and its more specific segments (Hartmann & Siegrist, 2017; Hocquette, 2016). Also, it needs to be established more clearly still to what extent the large amount of contradictory information is due to (1) academic and scientific dissension, (2) the sensation-driven mechanisms of the literary genre studied, (3) the clash of economic and other societal agendas, (4) the flexibility and versatility of meat as such, and/or (5) more recent post-truth effects with respect to food in general. Finally, follow-up studies should look at the period past the IARC report of 2015, which may have its own specific dynamics. Thereby, it would be advisable to compare the British and conservative specificities of the *MailOnline* with other media, varying in geographical origin and socio-political positioning.

## Declarations of interest

None.

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## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.appet.2018.02.028>.

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