British and Irish newspapers implicitly support single-use masks over reusable face coverings

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Introduction: The environmental impact of waste caused by single-use masks or face coverings is an under-considered effect associated with the COVID-19 pandemic. The combination of the protective purpose of face masks and their potential environmental impacts through littering or waste management means the wearing of face masks is simultaneously associated with the health crisis and creation of a new environmental challenge, combining two strands of journalism.

Methods: Our study demonstrates how the discourse in British and Irish newspapers in the March 2020-December 2021 time frame relates to this problem. By a combination of quantitative and qualitative discourse analysis, we identify concepts commonly associated with the terms "face-covering" and "mask," particularly concerning whether they refer to a disposable or reusable item.

Results: Results suggest that the newspaper discourse generally favored references to single-use surgical masks. Newspapers reported on the environmental impact of face masks only in very limited ways.

Discussion: We propose that the increase in waste caused by face masks can be related to prevailing representations of single-use surgical masks and limited attention paid to environmental concerns.

KEYWORDS

newspaper discourse, mask, face-covering, COVID-19, environment

1. Introduction

The Covid-19 health crisis led to the widespread general use of masks or face coverings, particularly in European countries where these items were previously only sporadically used by the population. Due to the unprecedented effects of the global pandemic, people around the world were keen to adopt the best ways to protect themselves—especially during the peak times of Covid-19 outbreaks. Early on, the World Health Organization (WHO) issued interim guidance on face mask-wearing as an option to control the spread of the virus in the community and in healthcare settings (WHO, 2020; 29 January 2020). However, this guidance acknowledged that wearing face masks when not indicated (e.g. in the community when not symptomatic) might cause unnecessary financial burden and create a false sense of security, hindering other measures such as good hygiene. The potential for a global face mask shortage, if all affected nations pursued a face mask policy during the early pandemic period, was also identified (Wu et al., 2020). In practice high demand and a panicked market, coupled with global supply chain disruptions, did result in a shortage of face masks during the initial phase of the pandemic (Cohen and Rogers, 2020).

As the pandemic progressed, face mask-wearing formed part of a three-strand strategy used by many governments, alongside regular washing of hands and social distancing, to avoid infection and reduce transmission of the virus (Prata et al., 2021; Tallic et al., 2021). Consequently, face masks became an ordinary part of people's daily life. This social change resulted in the availability of a large variety of face masks, both single-use and reusable; and including a wide range of designs and materials. In this paper, we refer to two main types: reusable cloth face coverings (FC) (whether homemade or shop bought), and single-use surgical masks (SM) which are formed from a three-layer melt blown and spun bonded polypropylene fabric. This reflects the terminology used by the UK government during announcements in the summer of 2020, when face coverings were initially recommended for community use, to assist reopening after lockdown (BBC 14/07/2020; 31/07/2020)[1] We additionally use the term face mask (FM) to cover both SM and FC, but in the knowledge that there is a strong bias toward reading FM as synonymous with SM in many cases, so avoid this term where possible. The FFP2 or N95 respirator-type masks did not enter discourse in the UK in a significant manner until after the period studied by this paper, so they are considered out of scope. Yet, to our knowledge, no linguistic or media study has so far investigated the distinction made in discourse between these different items, and the diversity of concepts and implications associated with the terms "mask" and "face-covering".

Distinguishing the differences in usage between "face mask" (FM), surgical mask (SM) and "face-covering" (FC) can highlight prevailing references to single-use items as opposed to reusable ones or vice versa. Our first research question (RQ1) in this paper, therefore, concerns how surgical "masks" (SM) and "face-coverings" (FC) are formally defined and what key concepts are associated with each term. These formal definitions are then compared with the use of each term in British and Irish newspapers. This relates to our second main research question (RQ2) which aims at uncovering how the representations of "masks" and "face-coverings" differ in newspapers, and what type of FM is predominantly promoted. Our third research question (RQ3) relates to environmental considerations, motivated as follows.

1.1. Environmental considerations

Even though reusable and single-use FM offer effective protection against the Coronavirus (Eikenberry et al., 2020), the rapid adoption of FM-wearing also has a considerable impact on the environment. For instance, littering of FM was reported in many metropolitan areas during 2020–21, these included Mexico (Kutralam-Muniasamy and Shruti, 2022), Canada (Ammendolia et al., 2021; France, 2022), Kenya, South Africa (Ryan et al., 2020), Hong Kong, Ghana, Bangladesh and Turkey (Li et al., 2022). Many studies have considered the microplastics which are emitted from FM during weathering once they have been littered or lost into the environment (Ma et al., 2021; Morgana et al., 2021; Saliu et al., 2021; Wang et al., 2021). Further studies have investigated the effect of

the microplastics from littered FM on soil invertebrates, such as earthworms and springtails (Il Kwak and An, 2021). Additionally, antioxidants and additives used in polymer processing are present in SM in trace quantities and may be released into the environment (Fernández-Arribas et al., 2021; Liu and Mabury, 2021; De-la-Torre et al., 2022). Even when FM are disposed of through conventional waste streams there is an environmental cost associated with materials and manufacturing, as evaluated by life cycle assessment (LCA) and in particular the need for landfill or incineration of this additional quantity of waste material associated with single-use masks. LCA also addresses the question of the carbon dioxide and other greenhouse gases associated with the manufacture, use and disposal of FM, providing a value for global warming potential (GWP) indicating any contribution to climate change (Lee et al., 2021; Rodríguez et al., 2021).

Many scientific studies have considered the surge in waste relating to SM (Klemes et al., 2020a; Selvaranjan et al., 2021; Siwal et al., 2021). The present research focuses on British and Irish contexts, addressing our own lived experience through the pandemic that motivated a more systematic study. Notably, existing environmental reports have shown that the UK and Ireland have experienced a large increase in mask pollution (from September 2019 to October 2020) relative to other countries during this period (Chowdhury et al., 2021; Roberts et al., 2022). A study in the UK also estimated that if each individual used one disposable SM a day for a year; this would create over 124,000 tons of unrecyclable plastic waste, of which 66,200 tons would be potentially contaminated waste (i.e. worn masks) and 57,400 tons would be plastic packaging (Allison et al., 2020).

In this paper, we consider FM use by the general public in Britain and Ireland. SM and FC were significantly used during the peak times of the pandemic, consistent with media discourse advising the use of FM as effective protection. However, it is less clear to what extent the British and Irish population was made aware of the environmental risks associated with using single-use FM. Our third research question (RQ3) therefore concerns how the environmental impact caused by single-use FM was represented in newspapers at key time periods.

This is motivated by previous insights on the role and responsibility of media representations concerning health and environmental practices, as follows.

1.2. The role of the media

Newspapers can provide a significant platform for environmental and health scientists to popularize and explain their findings (Knudsen, 2003; Olausson, 2009). Notably, the World Health Organization insisted that newspapers have a key role in limiting misinformation about COVID-19 by presenting reliable, scientific information (Zarocostas, 2020; de León et al., 2022). Existing analyses of media discourse, however, demonstrate how newspapers tend to amplify scientific certainty, abstracting from the nuances that are key to academic research (Bell, 1994; Olausson, 2009; Schafer and Schlichting, 2014). This sort of bias toward a clear-cut message can confuse readers when reporting on scientific information associated with environmental and health

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1   BBC (14/07/2020) URL https://www.bbc.co.uk/newsround/53393885.
BBC (31/07/2020), URL: https://www.bbc.co.uk/newsround/52200989.

crises (Bell, 1994; Weingart et al., 2000). For example, comparing journalistic and scientific discourses, Williams Camus (2015) demonstrated that scientists focus on justifying their activities and findings, whereas journalists aim to attract readers' attention and rely on broader scientific claims to legitimize their stances, avoiding details and favoring linguistic creativity. As such, there are abundant grounds for questioning references to scientific findings about health and the environment in newspapers, with journalists sometimes prioritizing their own opinions on health and environmental topics and discarding scientific warnings (Trumbo, 1996).

The topic of the Covid-19 pandemic has given rise to different representations of the crisis in newspapers. Focussing on the role of behavioral sciences during lockdown periods in the UK to support citizens suffering from the lack of social interactions, Sanders et al. (2021) documented a positive impact of journalistic descriptions of the health crisis, which in effect permitted behavioral sciences to be embedded in British policy. Furthermore, journalistic discourse in the US influenced the population to stay at home (Xue and Xu, 2021). Yet, these positive outcomes are balanced by the different stances adopted by journalists. These stances do not only convey contradictory information about Covid-19 to the readership, but they also attribute different causes to the pandemic. For instance, human responsibility for the spread of the virus has been viewed through the prism of humans' unsustainable consumption (Xue and Xu, 2021). Although this may engage US newsreaders into more environmentally friendly practices, the blame on humans has eventually led to discrimination (Pofi and Wing Fai, 2021). The enforcement of safety measures has also been compared with authoritarian measures such as the Holocaust, an association that increased confusion and shifted at a later stage into an association of negative reactions to Covid-19 law enforcement with Nazi acts (Sabucedo et al., 2020; Wicke and Bolognesi, 2020; Steir-Livny, 2021; Hanne, 2022).

Due to the combination of protective purposes and potential environmental impacts of littering or waste management, the wearing of FM is simultaneously associated with the health crisis and creation of a new environmental challenge, bringing together two strands of journalistic endeavors that have not often been examined jointly in previous research. Our research addresses this gap by examining newspaper representations of FM both concerning terminology used and concerning environmental impact.

1.3. Representations of face masks

While scholars predominantly focused on Covid-19 discourse, less attention has been paid to the representation of FM as a safety measure applied during Covid-19 periods. Yet, health scientists warned about the fact that the potential of FM was not well-understood by the public (Eikenberry et al., 2020).

For instance, studies have shown that white men in the US tended not to use FM (either during SARS-COV-1 or SARS-CoV-2) because they saw it as "shameful," a "sign of weakness," and a "stigma" when compared with women (Hearne and Nino, 2021). Furthermore, not wearing a FM was not always associated

with the item itself, but with political orientation: "anti-maskers" might refuse the use of FM as a symbol of disagreement with Covid-19 restrictions (Grunnawalt, 2021). FM were also related to religion, for instance, FM were compared with the Muslim burqa, itself sometimes interpreted as a symbol of "social control", as mandates required the global population to cover their faces (Kahn and Money, 2021). Also, FM could be seen as a symbol of activism: before the pandemic, FM were used by LGBTQ+ and feminist communities to fight against the caricatures of individuals belonging to these communities (Ciszek, 2017). FM wearing was a way to claim that these individuals are not different from others and to promote inclusion.

While the studies mentioned in this section did not distinguish between SM and FC, in the context of Black individuals' experiences of the pandemic and safety measures in the US and the UK it was observed that, for these communities, FC had quite specific connotations related to the fact that clothing items like bandanas had been racialised and linked to gangs and criminality (MacLin and Herrera, 2006). Consequently, Black participants interviewed as part of these studies stated that FC made them "look like a criminal" (Kahn and Money, 2021). In contrast, some of them praised the anonymity enabled by SM (Kahn and Money, 2021). SM may thus be favored by these communities as these are not associated with such stereotypes.

1.4. Overview of the content

Our study aimed to address the following specific research questions:

RQ1: How are surgical "masks" (SM) and "face-coverings" (FC) formally defined and what key concepts are associated with each term?

RQ2: How were SM and FC represented in British and Irish newspapers during the pandemic, and what type of face mask was promoted predominantly?

RQ3: How were the environmental issues and impacts related to face masks represented in newspapers?

In Section 2 we introduce the methodology used to analyse the corpus data. In Section 3, results first focus on existing definitions of FM (in Britain) with the main relevant distinction: reusable ones (FC) that are generally recognized as more environmentally friendly (e.g., Lee et al., 2021), and single-use ones (SM) that may provide higher health protection but cause a higher amount of waste and thus a strain on the environment (Prata et al., 2021). We then address the distinction observed in newspaper discourse between the terms "masks" and "face-coverings", followed by findings on the representation of the environmental impact of FM. Section 4 offers a discussion of our findings.

2. Material and methodology

In order to answer our three main research questions, we referred to various definitions available for the search terms "mask" and "face-covering" (see Section 2.1.). We built a dataset of newspaper articles with reliance on particular search criteria

(see Section 2.2.). We also searched for representations of environmental issues associated with FM in this dataset (see Section 2.3.) and we analyzed prevalent representations of FM (and their environmental impacts) in the newspapers (see Section 2.4.).

2.1. Definitions

In order to answer our first research question (RQ1), which concerns the formal definitions attributed to "masks" (SM) and "face-coverings" (FC), we paid particular attention to the official guidance offered by the British government. Such guidance is highly significant to our study as these represent one of the main sources of information regarding which type of FM the British population was *required* to use (and under which circumstances) during the pandemic. In Section 3, we thus investigated how the government referred to each type of FM and how these were distinguished by the government according to different practices and different communities (e.g., high-risk communities, children, etc.).

In Section 3, we also compared these governmental definitions that have been released during the pandemic with the long-established definitions proposed in the online version of the Oxford English Dictionary (OED3). The OED3 is regarded as "the accepted authority" on the English language and provides definitions that are relevant to "the English-speaking world"[2]— which can also help us to include definitions that concern the Irish population, consistent with our second and third research questions (see below). In addition, the online version of the dictionary also provides up-to-date definitions, as we will see that definitions have recently been modified to refer to the context of the pandemic. These long-established definitions can inform us about pre-existing representations of the concepts "mask" and "face-coverings" that may have had an impact on the population's practices during the pandemic. Accordingly, we looked at all the definitions provided for the words "mask" and "face-coverings", including the definitions which did not necessarily refer to a medical item, as these definitions could still inform us about the varying conceptualisations and connotations particular to each word and may have an impact on their representations in (newspaper) discourse.

2.2. Data collection

To address our second research question (RQ2), related to the representations of SM and FC in newspapers, we analyzed the words associated with "masks" and "face-coverings" in a selection of newspaper articles, to observe in what ways FM concepts are associated with environmental concerns and sustainable practices.

We used the *Nexis* database (n.d.), which provides access to publications such as newspapers, governmental communications, advertisements etc. published since the beginning of the 19th century.[3] Our search focused on newspaper articles published in

Great Britain and Ireland between March 1st, 2020 (when the World Health Organization declared the global pandemic) and December 2021 (the starting time of this analysis).

We created a corpus of newspaper articles covering this time period. For this purpose, we used three search formulae to study the different references to FM in newspaper articles during the COVID-19 pandemic (RQ2), these are:

> Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("mask" or "masks") and ("face-covering" or "face-coverings")
>
> Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("mask" or "masks") and not ("face-covering") and not ("face-coverings")
>
> Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("face-covering" or "face-coverings") and not ("mask") and not ("masks")

The first search formula provided articles that mention both "face-covering" and "mask" along with search terms pointing to the pandemic, whereas the second and third showed the number of articles which refer to either "mask" (formula 2) or "face-covering" (formula 3).

Following existing methodologies to analyse qualitatively and quantitatively a large corpus (Tognini Bonelli, 2001; Stefanowitsch, 2020), we first conducted a close reading of a sample of the total number of articles—retrieved as a result of the three search formulas detailed above—to observe the main distinguishing features in the references to "mask", "face-covering", and "mask *and* face-covering". This sample was composed of 3,000 articles (i.e., 1,000 articles pertaining to each search formula). We observed a tendency for articles in this sample to associate "mask" with mandatory procedures and health science and "face-covering" with governmental guidance. In order to test this observation within the entire dataset, we supplemented the initial search formulas with additional search terms:

> Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("mask" or "masks") and ("must" or "have to" or "has to" or "mandatory" or "mandate" or "obligation" or "rule" or "rules" or "ruled" or "ruling" or "policy" or "policies" or "require" or "requires" or "required" or "requiring" or "requirement" or "requirements" or "impose" or "imposes" or "imposes" or "imposed" or "imposing" or "order" or "orders" or "ban" or "bans") and not ("face-covering") and not ("face-coverings")
>
> Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("mask" or "masks") and ("science" or "sciences" or "scientific" or "research" or "academic" or "study" or "studies" or "studying" or "studied") and not ("face-covering") and not ("face-coverings")
>
> Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("face-covering" or "face-coverings") and ("may" or "might" or "can" or "could" or "would" or "if" or "guidance" or "advise" or "advice" or "advises" or "advised" or "advising" or "recommend" or "recommendation" or "recommended" or "recommending" or "encourage" or "encourages" or "encouraging" or "encouraged") and not ("mask") and not ("masks")

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2   According to oed.com, "about" section (consulted on 10/07/2023).

3   Nexis (n.d.). Available at nexis.co.uk (accessed September–October 2021).

Each of these three formulae was tested for both search terms (i.e., "face-covering" and not "mask"; "mask" and not "face-covering") so as to observe distinct uses. In other words, the formulae about mandatory procedure and science were also tested with "face-covering" and the formula about guidance was also tested with "mask" (see Table 2 below).

Although this methodology reduced the overall number of investigated articles, it allowed us to analyse major distinctions that appeared in the references to "mask" and "face-covering" in British and Irish newspapers. As the resulting number of articles obtained after applying these additional search formulae still represented a notable portion of the entire dataset (see Section 3), we could then manually analyse these articles in order to check that they actually reflected our initial observations (associations with a mandate; health sciences; guidance) and analyse the co-text and context of the use of each occurrence of the words "mask" and "face-covering" so as to understand the particularities of these different representations.

2.3. Selection of data related to the environmental impact of FM

To address RQ3 (addressing how the environmental impact of FM was represented), we selected articles associating FM with environmental concerns. The initial search formula had thus to be supplemented by environmental search terms. The search terms related to environmental issues associated with FM were identified after concomitant research on the software *SketchEngine* (Kilgarriff, 2014).[4] This identification of search terms is inspired by existing methodologies to analyse large corpora as defined by Stefanowitsch (2020). Accordingly, we used the Thesaurus option of the software, which displays a list of words that frequently occur (according to the software) within contexts that are similar to the contexts of use of the search term. This list of words associated with the search term thus displays the words whose meaning can be related to the meaning of the search term (e.g., synonyms, hyponyms, or hyperonyms).

For current purposes, we entered the search terms "pollution" and "waste" on Thesaurus to identify different words which could also refer to forms of pollution-waste and which could then be searched on *Nexis*.

This search yielded the following search terms: pollution—environment(al)—waste—climat(ic) (change)—climate crisis—global warming—recycle(ing)—disposable—plastic—litter(ing).

These findings from the Thesaurus led us to supplement our initial search formula, as in:

Formula ("COVID-19" or "SARS-CoV-2" or "coronavirus" or "pandemic") and ("mask" or "masks" or "face covering" or "face coverings") and ("pollution" or "pollute" or "polluted" or "pollutant" or "environment" or "environmental" or "waste" or "climate change" or "climate crisis" or "global warming" or "climatic change" or "recycle" or "recycled" or "recycling" or "recyclable" or "disposable" or "plastic" or "litter" or "littered" or "littering")

This selection of additional search terms related to the concepts "pollution" and "waste" cannot be exhaustive. It should be noted that although this approach is systematic, relevant search terms may have been missed because the software's Thesaurus had not been updated to include contexts related to Covid-19. For instance, some terms related to the environment were not displayed in the Thesaurus and, in contrast, the Thesaurus also displayed terms that were not used to qualify FM in our dataset of newspapers (i.e., sustainable-ility, ecology-ical, biodegradable, wildlife, resource-s, nature-al, damage-ing, impact, and landfill). Yet, this methodology allowed us to analyse more closely how environmental concerns associated with FM were represented in our dataset (i.e., the "implicit messages" uncovered through analysis; Hunston, 2002; see below).

Indeed, the results yielded by the Thesaurus option still needed to be carefully investigated through a close analysis of the contextual uses of each search term in the dataset. For instance, the adjective "disposable" (identified in the Thesaurus) may appear in a newspaper article but may not systematically qualify FM in the text. The occurrences of "masks" or "face-coverings" and "disposable" only represent partial clues suggesting that the newspaper article addresses the environmental impact of FM. Analysis of the co-text was thus required to make claims about the representations of FM.

2.4. Data analysis

The analysis procedures follow principles of collocation analysis in media discourse about social issues (e.g., Xiao and McEnery, 2006; Baker et al., 2008; Salama, 2011). In the remainder of this paper, we refer to "collocates of the search terms" to discuss the words occurring in the same sentence where the search terms appear (Sinclair, 1991). In particular, the analysis focuses on the "co-text", that is, the words found around the words in question, and the "context", that is, the circumstances against which the text has been written (Lyons, 2012, p. 258–292).

Many scholars have conducted collocation analyses following a statistical approach applied to a large corpus of texts to identify "characteristic co-occurrence of patterns of words" (Xiao and McEnery, 2006: p. 107). This approach differs from the collocation analysis conducted as part of this research: such a statistical approach is not compatible with our aim to uncover the different representations of SM and FC and the representations of environmental concerns in newspapers (addressing our three RQs, see Section 1.4). Instead, we supplement quantitative findings regarding the number of occurrences of each term ("mask" and "face-covering") with a qualitative analysis of the terms used in context, recognizing that collocates contribute to the meaning of

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4 *SketchEngine* (Kilgarriff, 2014) is a software giving access to a large variety of electronic corpora, which include corpora of British English texts, German texts, French texts, historical and modern texts, political texts, scientific texts, etc. The software also provides a large variety of functions helping researchers to automatically analyse electronic corpora.

a word and can also "convey messages implicitly" (Hunston, 2002). This approach can thus be viewed as one way of analyzing discourse through corpus assisted methodology (Gillings et al., 2023).

In accordance with the primarily qualitative approach to collocation analysis, we manually analyzed the co-text (the surrounding text) and context (the circumstances against which the text has been written) of each occurrence of the search terms so as to identify the different topical themes associated with these search terms. Following this approach, we aimed to gain some insight into the different thematic representations of FM in our dataset.

It should be noted that the themes presented below are purposefully general. These represent major distinctions as observed in our dataset between different representations of FM and different environmental concerns. We performed a manual count of generalized themes which were, however, not associated with specific keywords. Notions such as "mass consumption" or "links between Covid-19 and climate change" are thus still open to subjective interpretation and debate. These themes do not reflect the total number of articles in our dataset. Some representations of FM are too ambiguous to be included within our research, and some are not relevant to our research (e.g., figurative occurrences). We did not, however, conduct a syntactic analysis to distinguish between nominal and verbal forms of the search terms: our main interest is to analyse their meaning in context through a collocation analysis (see Hunston, 2002), in accordance with our three RQs. The analysis of thematic representations in the dataset does not allow for direct comparison between the themes associated with "masks" as opposed to "face coverings", as the theme categories were developed from the data and hence differ, as the terms are used in different ways (see Section 3).

In the following section, we provide quantitative overviews and then analyse selected examples from our dataset that illustrate different representations of FM. Section 3 addresses RQ1, i.e., the formal definitions attributed to surgical "masks" (SM) and "face-coverings" (FC) and the key concepts associated with each term. We then discuss the different representations of "masks" and "face-coverings" in the dataset composed of British and Irish newspaper articles published during a key time period of the pandemic (RQ2). Next, we examine RQ3, i.e., how the environmental impact of FM was discussed in the newspapers during this period. Together, these perspectives highlight to what extent the collected British and Irish newspapers may have promoted the representations of single-use SM over reusable FC.

3. Representations of "masks" and "face-coverings"

3.1. Existing definitions of FM: "mask" and "face-covering"

In March 2020, the UK government issued specific definitions for FM on its official webpage, distinguishing between (1) surgical face masks defined as being "mainly intended for health care staff to wear to protect patients during surgical procedures and other medical settings"; (2) transparent face masks defined as a "medical device intended to protect patients"; and (3) face-coverings defined as being "intended for the use by the general public, which should

not be sold as medical devices" (UK Government, 2020[5]). Thus, the UK Government explicitly distinguished between "masks" (surgical or transparent) as items exclusively used by health professionals and hospitalized patients, and "face-coverings" as items to be used by the general public. It is to be noted that during the early stages of the pandemic, the emphasis on surgical "masks" (SM) can be related to the scarcity of medical grade masks for healthcare and social care situations—which had the greatest need for protection to be able to deliver their essential services and minimize transmission (Wu et al., 2020). At this time there was a lack of both surgical and cloth face-covering options in the shops. Later, the trend shifted toward "face-covering" (FC) as a specific homemade fabric mask (Bhattacharjee et al., 2020) or a shop bought equivalent, to assist the return to work during relaxation of lockdown rules in the summer of 2020. SM availability also steadily increased during this period. This resulted in mixed uptake of both SM and FC by the public.

Contrasting with the governmental definitions that were made available with relevance to the Covid-19 pandemic, consider the long-established definitions available in the *Oxford English Dictionary* (OED3).[6] Here, a "mask" is "a covering worn on or held in front of the face for disguise" (definition 1.a.); "a representation of a human face or animal head, originally made for religious or ceremonial purposes" (definition 1.c.); "A pretense, a front, an outward show intended to deceive" (definition 2.a., figurative use), "A facial expression assumed deliberately to conceal an emotion or give a false impression" (definition 2.c., figurative use); "A device placed over the nose and mouth, through which oxygen or gaseous anesthetic is inhaled" (definition 3.c.); "A woman's face as disguised by cosmetics" (definition 4.a.). In contrast, the OED3 defines a "face-covering" as "any of various types of masks or coverings worn to protect or conceal the face; (now) *esp. one* worn over the mouth and nose in order to reduce the transmission of infectious agents" (definition C2).

Later on, updates of the OED3 have associated the term "face-covering" with the context of the COVID-19 pandemic. While the above definition has remained unchanged, it is now followed by a contextual example selected from the UK newspaper *The Independent* ("The mayor of London has said that masks should be made compulsory on public transport, citing evidence that suggests face coverings reduce the spread of coronavirus" OED3, accessed on 09/12/2022). Such a contextual association has, however, not been observed in the most recent updates of the OED3 definitions for the term "mask".

Thus, following the OED3, "face-covering" relates to a general form of health protection, whereas "mask" is associated with various uses across quite diverse settings; in health-related contexts, it is associated with critical health conditions (i.e., face masks worn at hospitals, providing oxygen or a gaseous anesthetic). This highlights more traditional concepts commonly associated with these terms. It stands to reason that such well-established associations did not become invalid with the onset of the pandemic, even though the practice of wearing FM has changed dramatically

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5 UK Government (2020). Available at gov.uk (accessed 26 November 2021).

6 Oxford English Dictionary (OED3). Available at www.oed.com (accessed 26 November 2021).

TABLE 1 Articles mentioning "mask" OR "face-covering" at least once, articles mentioning the two search terms at least once, and the total number of articles in the dataset—per month.

Months	Number of articles mentioning only "mask"	Number of articles mentioning only "face-covering"	Number of articles mentioning "mask" and "face-covering"	Total per month
Mar-20	4,975	**3**	**2**	4,980
Apr-20	**6,721**	**45**	272	**7,038**
May-20	**5,544**	350	560	6,454
Jun-20	4,247	553	817	5,617
Jul-20	4,505	568	**1,477**	**6,550**
Aug-20	3,788	691	**1,000**	5,479
Sep-20	3,979	**1,018**	773	5,770
Oct-20	4,993	786	652	6,431
Nov-20	3,523	535	357	4,415
Dec-20	3,211	451	280	3,942
Jan-21	3,483	378	430	4,291
Feb-21	2,530	322	235	3,087
Mar-21	2,672	347	228	3,247
Apr-21	2,537	363	**205**	3,105
May-21	2,408	373	316	3,097
Jun-21	2,361	332	214	2,907
Jul-21	3,540	319	929	4,788
Aug-21	2,164	240	305	2,709
Sep-21	**1,949**	177	218	**2,344**
Oct-21	**1,925**	153	302	**2,380**
Nov-21	2,144	169	348	2,661
Dec-21	2,742	556	427	3,725
Total	**75,941**	**8,729**	**10,347**	**95,017**

Bold values are related to the highest and lowest numbers of articles in our dataset.

in British society. To a degree, there is consistency with the government's distinction between masks as associated with health professionals, as opposed to face-coverings as more appropriate for the general public.
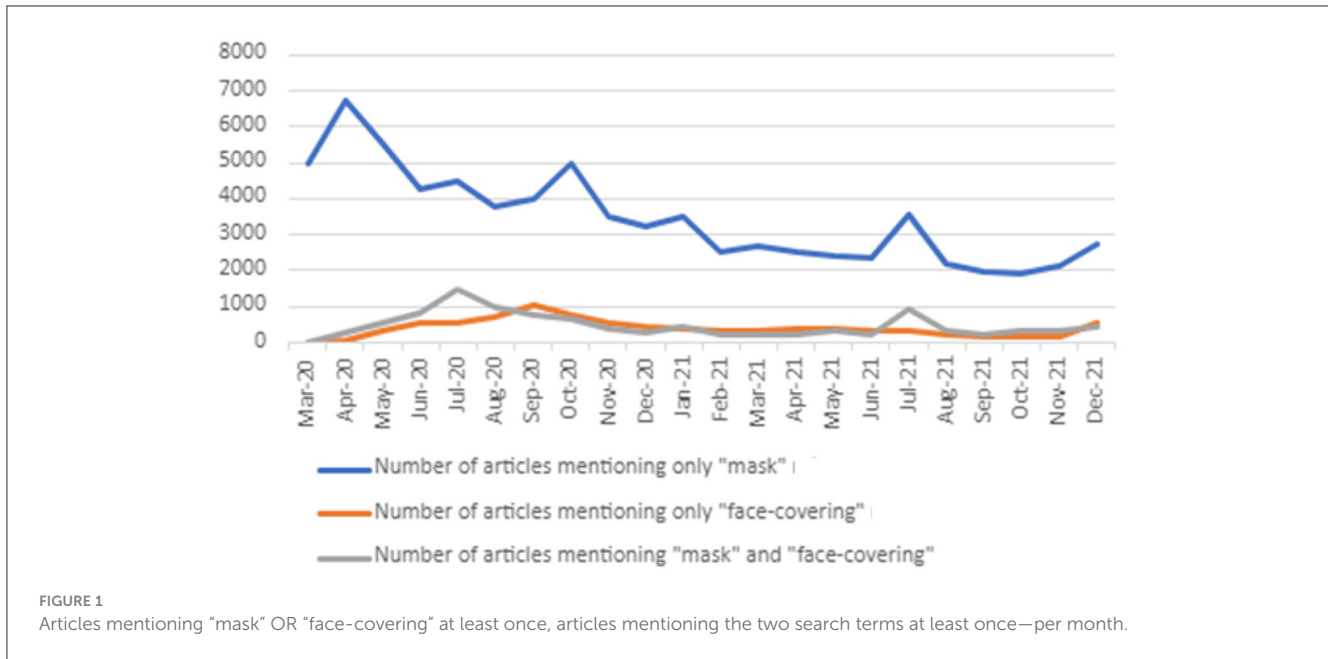
In other words, the definitions found in the OED3 and produced by the UK government both suggest an association of the term "mask" with a single-use, surgical item intended for medical contexts, whereas "face-covering" is more likely to refer to a reusable item for more general public use. However, this does not imply that the media, or indeed the general public, also recognize such a distinction—or that environmental concerns are accounted for at all.

3.2. Distinctions in the representations of "mask" and "face-covering" in newspapers

Table 1 and Figure 1 show the number of articles where each word - "mask" and/or "face-covering" - appeared at least once in

the texts obtained after applying the search formulae described in Section 2.

Table 1 and Figure 1 demonstrate that the term "mask" appears far more frequently than "face-covering" in our dataset and far more frequently than the combination of the terms "mask" and "face-covering". The Covid-19 pandemic and the combination of discussion and policy around FM wearing have unsurprisingly increased the number of occurrences of both search terms. The chronological (monthly) frequencies presented in Table 1 and Graph 1 show that the term "mask" was predominant during the early stages of the pandemic (April-May 2020). Regarding the frequencies of the term "face-covering", findings show that the use of the term increased during the period of lockdown easing in the UK (May to August 2020), when government updates were frequently issued using this term, and reported by journalists. Use peaked in September 2020. —A period which separates the first from the second national lockdown in the UK. The term was only rarely used at the beginning of the pandemic (March-April 2020), as government guidance focused on lockdown measures and social distancing. The frequencies presented in Table 1 also explicitly

FIGURE 1
Articles mentioning "mask" OR "face-covering" at least once, articles mentioning the two search terms at least once—per month.

show a shift from "mask" to "face-covering": the frequencies for "mask" are higher in April-May 2020, then July-August 2020 represents the period during which the highest frequencies of the combination "mask-face-covering" occurs to lead to the highest frequencies of "face-covering" a month later, in September 2020. Therefore, these frequencies show that representations of "face-covering" have progressively gained significance in the British and Irish newspapers along with the process of lockdown easing and return to the workplace and social settings for the wider population. Notably, usage of "face-covering" decreased to a relatively stable level throughout 2021, reflecting either fewer governmental updates or familiarity with the topic. Use of the term "mask" continued at a higher rate during 2021, with a minor peak in July 2021 which may relate to a focus on holiday advice articles.

Next, we analyzed these occurrences in context in order to identify the different or identical themes pertaining to each search term, following the methodology detailed in Section 2. Table 2 presents the main themes identified in the dataset.

In the context of the pandemic, the term "mask" in our dataset was found to refer to mandatory procedures. The word is used to describe governmental restrictions and enforcement of FM-wearing. For instance, "mask" collocates with (i.e., appears in the context of) words such as "mandatory", "rules", "prevent", "mandate", "policy", "requirement", "protocol", "control", "impose", "order", "slogan", "ban", as in example (1):

(1) July 19 lockdown changes in full as England hit by new *mask* and Covid passport rules (*Mirror*, July 12, 2021).

The selected articles also use the word "mask" in the context of questioning governmental stances toward FM and highlighting people's confusion regarding safety measures. Yet even in this context, "mask" remains associated with governmental measures (based on health sciences), as in example (2):

(2) Studies suggest *masks* cut Covid-19 transmission by up to 80%. Few places demonstrate the contested role of the *mask* more

TABLE 2 Representations of FM in our dataset: prominent themes.

Themes	Number of articles
Representations of "mask" associated with governmental *mandates* Representations of "face-covering" associated with governmental *mandates*	47,421 articles 193 articles
Representations of "mask" associated with the medical frame-health sciences Representations of "face-covering" associated with the medical frame-health sciences	17,016 articles 30 articles
Representations of "face-covering" associated with governmental *guidance* Representations of "mask" associated with governmental *guidance*	4,813 articles 5,850 articles

clearly than the London underground system (*The Observer*, August 31, 2021).

Overall, as in these examples, our data show that the association between "masks" and protection was promoted in the collected newspaper articles. The word occurs within medical or scientific frames, and it is strongly associated with governmental measures. It is thus evident that "mask" refers to the items typically used in medical settings (i.e., surgical, single-use masks), for protection, and is associated with rules that people need to respect under different circumstances.

These findings can be contrasted with the uses of the term "face-covering" in our dataset, which are more limited in number. During the pandemic, the concept is primarily associated with non-mandatory procedures, according to the occurrences retrieved from our dataset. For instance, it can collocate with the modal

TABLE 3 Overview of articles referring to environmental issues in our dataset.

Total number of articles in our dataset ("mask" and-or "face-covering")	95,017
Total number of articles in our dataset mentioning a minimum of one environmental search term (anywhere in the text)	2,365

auxiliaries "may/might" as in "*face coverings* may be used by…". It is also used within hypothetical clauses such as "wear a *face covering* if you have symptoms". The UK government also refers to "face covering" in their publications from 2021, when COVID-19 restrictions were lifted. This is exemplified in example (3):

(3) Visitors [in municipal businesses and beachfront hotels and bars] are left to decide for themselves if *face covering* is the order of the day outdoors (telegraph.co.uk October 8, 2021; our addition in square brackets).

In other cases, the phrase "face-covering" is used to mention guidance for specific communities, such as children, visitors, people suffering from symptoms, or non-vaccinated people. Alternatively, it is used to describe guidance applied in one's home. This shows that "face-covering" defines an item that is to be applied under certain circumstances. It is related to people's choice to wear it or not (at home). The phrase is also used in negative sentences, describing people not wearing face-covering. This is exemplified in example (4):

(4) People *not wearing face coverings* could be forced to prove they have medical reason. A senior SNP MP said bus drivers and shop workers are exasperated by a "growing minority" of people who are *refusing to wear a face covering* despite having no medical excuse (*Daily Star*, September, 2, 2020).

Therefore, in our dataset, "face-covering" is used in contexts where covering one's face is not mandatory (lifting of restrictions), or where the measure only applies to particular communities. "Face covering" thus defines an item that people choose to wear, and it is highly related to one's individual liberties. "Face-covering" is described as a device used by the general public, and it distinguishes particular communities in terms of their health conditions and vulnerability during the pandemic.

We now turn to the different references to FM in the environmental contexts described in newspapers.

3.3. Environmental representations of FM

To address RQ3, we start by examining the number of articles that explicitly refer to the environmental effects of FM, or littering and pollution resulting from FM, as represented in Table 3.

Table 3 demonstrates that environmental considerations represent a limited number of the overall FM descriptions in British and Irish newspapers released during the pandemic. Indeed, environmental descriptions only represent 2.5% of the total number of articles included in our dataset.

The newspaper articles from our dataset may directly or indirectly discuss this topic. From this search, we identified the main, distinct ways in which journalists addressed the issue and categorized them as follows (following the methodology discussed in Section 2).

Table 4 shows that the environmental theme most commonly identified in this part of our dataset associates the Covid-19 pandemic with climate change. In such cases, journalists refer to Covid-19 policies and restrictions which could either impact climate change-related policies (e.g., the increased use of plastic items—see below) or be set as a model to enforce climate change-related measures, as in example (5):

(5) Thunberg was joined by co-campaigners Luisa Neubauer from Germany and Belgium's Anuna De Wever and Adélaïde Charlier, all of whom wore masks as they made their way to the chancellery from Berlin's main train station. During 90 min of talks, the young campaigners said they urged Merkel to tackle carbon emissions with the same urgency and drastic measures that leaders have displayed in the battle against Covid-19 (*The Guardian*, 20/04/2020).

In this extract selected from our dataset, the meeting of climate activists with the then-German chancellor Angela Merkel is described. On this occasion, the campaigners mentioned the Covid-19 measures (the journalist also insists on the fact that these activists were wearing "masks", possibly as an implicit way to illustrate such measures) to draw a comparison with the political measures taken against the climate crisis. This presupposes that for these activists, environmental policies lack the urgency and drastic measures that qualified Covid-19 policies. Hence, their argument is that climate change and Covid-19 should be viewed through the same lens by politicians.

According to the results displayed in Table 4, the second main environmental theme is related to the impact of pollution. This theme similarly covers global pollution (e.g., the rise of greenhouse gas emissions during the COVID-19 period) and local pollution (e.g., local waste). These articles all mention FM as a direct (waste) or indirect (discarded or non-recyclable items including FM) cause of pollution, as in example (6):

(6) There was 91 times more litter from face masks recorded in the first 7 months of the pandemic, creating plastic pollution that could last hundreds of years and potentially increasing the spread of coronavirus, according to a study. Researchers at the University of Portsmouth are urging the Government to launch legislation to prevent PPE littering after two million items were collected across 11 countries. They warn that discarded face masks can act as a vector to spread Covid and cause infrastructure problems such as blocking sewers. In addition, face masks can pose a threat to animals, which can choke on them or suffer problems if they eat them. The waste can also damage plant life. And in the long term, the researchers warn that dropped face masks can help transmit pollutants as well as becoming microplastics that enter the food chain (*Daily Telegraph*, 10/12/2021).

Example (6) links the waste caused by FM to the more general topic of "plastic pollution". It also illustrates existing concerns regarding the danger to health represented by discarded FM as

TABLE 4 Number of articles categorized per environmental themes (following collocation analysis).

Themes / Search terms	Polluting impacts	Guidance on disposal	Benefits versus risks of FC	Recycling possibilities	Mass consumption	Link COVID-19 and climate	Total per search term
Climate change	22	7	60	*3*	62	**467**	621
Environment	**193**	*11*	76	14	24	92	410
Plastic	**123**	10	102	*9*	20	45	309
Waste	**146**	11	61	*6*	28	24	276
Disposable	59	*7*	**112**	10	8	22	218
Pollution	67	7	24	*6*	10	**99**	213
Recycle	**52**	7	19	21	30	45	174
Litter	**100**	10	*2*	5	12	15	144
Total per theme	762	70	456	74	194	809	2.365

Italics, lowest numbers of articles; bold, highest numbers of articles per search term.

discussed by the journalist: "potentially increasing the spread of coronavirus". The concern about viral particles was grounded in scientific understanding at that point in time, as discussed by Klemes et al. (2020b) in considering the decontamination of medical waste PPE. In this extract, the journalist also refers to the impacts on animal and plant life. Yet, even if FM waste is said to increase "microplastic" pollution, we can see that the long-term threat to the environment is not explicitly discussed: this extract only highlights that FM waste can have long-term consequences—but such consequences are not discussed at length. However, such descriptions of the pollution caused by FM waste effectively explain to the readership that littered FM represent a significant concern, as the waste is not only associated with plastic pollution but also with human health (risks of spreading the virus). Therefore, these descriptions can persuade readers to be more careful in the way they dispose of FM.

The third most frequent environmental theme is related to the benefit or risk of "face-covering". In these descriptions, journalists aim at distinguishing the use of "mask" and "face-covering" and such descriptions may involve the more limited environmental impact of "face-covering". Along with this limited impact, "face-covering" is also perceived in a positive light because the public may feel more comfortable using an FM that has different colors or different patterns, as in example (7):

(7) The fashion industry has long convinced us to wear the previously unthinkable, so strong is the magnetic pull of our desire to fit in. Beyond the unsightly, our sartorial back catalog ranges from the impractical to the downright uncomfortable. (…) Designer Florence Bridge, who has been selling face masks from deadstock fabric for a few months, explained to Drapers, "A lot of customers told me they felt like a bank robber wearing some other face-coverings. Which is a particular issue for those with kids. If masks can look nicer, then it will encourage more people to wear them." (*The Independent*, 14/07/2020).

In this extract, "face-covering" is described through the lens of a fashion designer. She highlights that public response to this item can be twofold: on the one hand, some people claim that it "made them feel like a bank robber" (a conceptual representation that can only hold for face-coverings as opposed to surgical masks—which the public is used to seeing in medical contexts) and on the other hand, the designer suggests that the fashion industry has a role to play in making face-covering "look nicer" so as to "encourage people to wear them". Therefore, the designer focuses on the role played by the fashion industry to contradict the public conceptualization of face-covering (i.e., associated with criminality) and turn the item into a fashionable clothing item that people would want to wear. In example (7), we can also observe that environmental concerns are briefly mentioned as the "face-coverings" referred to in this article are made out of "deadstock fabric", which associates face-covering with upcycling practices. However, this positive impact of face-covering is only implied: this is possibly due to the topic of the article i.e., the fashion industry, which itself represents a major source of pollution (Niniimaki et al., 2020).

The fourth most frequent environmental theme is associated with mass consumption. Within this theme, FM can be described as a component of mass consumption (e.g., the surge for FM during the early stage of the pandemic), or mass consumption can be described as the cause of the enforcement of safety measures (e.g., wearing FM in shops after the re-opening). Mass consumption can also be perceived in a positive light when journalists present (online) consumption as a good activity to perform during lockdown. Similarly, journalists can discuss the role of (the fashion) industry in influencing the public to wear environmentally-friendly FM, as in example (8):

(8) Opening exactly a year after the UK government advised people to start wearing face coverings in public, a new exhibition plots the risky journey of the face mask from health necessity to fashion statement. (…) The exhibition

will also feature a parallel photographic element articulating how masks have become highly disposable and a danger to the environment. (…) Groves said the fashion industry had a complicated relationship with masks. Though some labels had masks in their collections before the pandemic, most notably Virgil Abloh's Off-White, everything changed in March 2020. "Covid-19 has compelled all brands to take a position on masks," Groves said, adding: "We were surprised that designers didn't produce masks for most of the year." (*The Guardian*, 20/04/2021).

In this extract, the journalist describes an exhibition about FM which, according to the article, illustrates how FM have progressively become a "fashion statement". This association between FM and fashion is also perceived through the environmental lens, as the exhibition shows the danger represented by "disposable" FM. This is followed by an argument that can be related to the argument presented in (7), the fashion industry is given a prominent role in influencing the public to favor face-coverings over disposable surgical masks. Yet, this extract indicates that this association between face-covering and fashion has been too limited ("designers did not produce masks for most of the year"), which represents an additional explanation for the prevalent references to "mask" in newspapers, as demonstrated in Section 3.2.

The descriptions of recycling practices are much more limited in our dataset. This theme covers descriptions of recycling bins that have been placed in shops (e.g., ReWorked,[7] descriptions of items made from recycled FM (see Saberian et al., 2021), descriptions of FM made from recycled items (as in 7), but the articles from our dataset also point out the difficulties of recycling FM, as in example (9):

(9) With face-coverings here to stay, conservationists are calling for recyclable alternatives: Professor Mark Miodownik, a mechanical engineer at University College London's Plastic Waste Innovation Hub, said masks were very difficult to recycle, meaning they were incinerated, sent to landfill or littered. "It's technically possible to recycle any plastic. But it's just not economically viable when the mass of the items involved is tiny. To get the value out of them is very hard," he said. Engineers are exploring ways of getting around this problem by using bacteria or chemicals to break down mixed plastic - such as laminates, bags and potentially masks - into a plastic soup that can be used for new products. But that is some way off. Others are examining methods of mixing discarded masks with rubble to form an aggregate building material. But with any of these options, collection will be a problem (*Sunday Times*, 14/02/2021).

In this extract, a mechanical engineer explains the reasons why FM are not widely recycled—and thus represent an environmental threat. He informs readers that recycling possibilities do exist ("it is technically possible to recycle any plastic") but cannot be enforced because of the limited economic impact. The journalist also refers to the possibility to transform FM into "aggregate building material" but still mentions the "problem" of collection. Therefore,

this extract shows that recycling possibilities are associated with a lot of doubts—in this case, backgrounded by science. Such descriptions may thus not encourage the readership to use recycling bins. In addition, the article does not refer to "face-covering" as an alternative to prevent waste. We found that recycling FM was only a minor theme (74 items) in our dataset, and this is likely to relate to the unanswered technological questions and a lack of clear options for the journalist to present to the readership.

Related to the theme "recycling possibilities" is the theme "guidance on disposal" (70 items). The low frequencies associated with these two themes show that the public was not sufficiently informed about what they should do with worn-out FM. This represents another explanation for the significant waste caused by FM: first, newspapers mostly focused on "mask" (disposable item; Table 1), second, journalists only paid limited attention to the environmental impact of discarded FM (Table 3), and third, journalists did not guide the public regarding worn-out FM (Table 4). The descriptions of guidance on disposal that are part of our dataset also suggest that worn-out FM are represented as a non-recyclable item, as in:

(10) But more and more are being left on the streets as people are not disposing of their single use masks properly. Belfast City Council said yesterday on social media that they have noticed an increase in masks on the street and have urged people to make sure they are put in the nearest waste bin - and not a recycling bin (*Belfast Telegraph*, 08/10/2020).

While this extract mentions the waste caused by FM ("people are not disposing of their single use masks properly"), the guidance provided by the Belfast City Council insists on the representation of FM as a non-recyclable item which should not be placed in the "recycling bin". Instead, the guidance is only about disposing of the FM in the "nearest waste bin" which implies that no guidance that are particular to FM has been provided. This is correct, as during 2020 very few technical solutions had been provided at suitable scale for recycling the non-woven plastic of the surgical masks, and disposal in existing plastics waste collection schemes would have hindered the recycling of other plastics. FM are therefore described as any other disposable item. In addition, the extract does not explain the reason why the city council "urges" people to dispose of FM in bins: the journalist only mentions that FM have been found in the streets, but the environmental risk associated with the waste (i.e. litter in the environment) is only described indirectly.

These environmental themes provide significant information that can help us illustrate the role played by newspapers in limiting the waste caused by FM: the discussion of these extracts has demonstrated that the long-term risks caused by the waste is not explicitly detailed—even in descriptions focusing on the pollution caused by FM, as these only vaguely refer to the long-term consequences of "plastic pollution". The journalists also shed light on the responsibilities of the fashion industry: the prevalent representation of "masks" in newspapers observed in Table 1 is—according to this part of our dataset—due to the limited availability of face-coverings, which have not triggered designers' interests. Consequently, the limited designs and the lack of representation of face-covering as a "fashionable" item can explain why journalists did not pay sufficient attention to face-covering. Most importantly, we have seen that newspapers did not offer enough guidance to

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7   ReWorked: https://www.reworked.com/2021/06/11/which-morrisons-stores-can-you-recycle-face-masks-in/.

their readership regarding the ways to dispose of FM: on the one hand, recycling possibilities are surrounded by many unanswered questions and on the other hand, the waste caused by FM is to be solved by disposing of the items in waste bins while the environmental impact of FM (and the possibility to use a reusable face-covering) is not mentioned by journalists.

4. Discussion

Our study examined the terminology used in British and Irish newspapers during the Covid-19 pandemic against the definitions available that highlight their associated meanings, as well as the extent to which environmental risks were explicitly represented.

Taken together, our analysis consistently reveals that environmental concerns did not play a prominent role in the representations of FM in the British and Irish newspapers during the pandemic. This is manifest in two ways. First, our quantitative analysis showed that the collected newspapers favored references to "masks" over "face-coverings"; scrutiny of definitions both by the OED and by the UK government shows a clear association of the former to single-use items, and of the latter to reusable items. Second, the British newspapers that we analyzed for this research only offered limited descriptions of the environmental impact of the waste caused by FM. Even the existing articles that addressed environmental concerns typically did not warn about the environmental challenges posed by widespread FM use. Our qualitative analysis furthermore highlights how British and Irish journalists effectively distinguished between the concepts "masks" and "face-coverings", and thereby implicitly promoted the general adoption of single-use SM. SM were generally associated in the media with general rules or group practices, while FC were consistently associated with practices performed by certain communities.

While our research focuses on representations of FM in newspapers, further factors that affect people's choice of FM include messaging from the NHS, national and devolved government, social media, local messages, or other media resources. A further limitation concerns our dataset of newspaper articles, which was collected systematically according to selected criteria; different selections or wider datasets may lead to more comprehensive insights.

Nevertheless, our analysis clearly demonstrates the different representations of "masks" and "face-coverings" in British and Irish newspapers during the pandemic. In the collected newspapers, "mask" was consistently represented as a mandatory device either used in foreign countries or the UK, while the term "face-covering" served to individualize the wearers according to the circumstances they experienced.

Furthermore, the environmental concerns associated with FM were mostly disregarded; in our dataset, only a limited number of articles offered scientific findings to inform readers about environmental considerations. This is a chance missed, as media reports of such findings can be highly convincing to the public and might encourage news readers to switch to using reusable FM.

In other articles, journalists described the waste caused by FM with references to recycling practices. These practices are still surrounded by a lot of uncertainties, notably for medical

waste where control of viral loading must be considered and decontamination would be required prior to recycling (Klemes et al., 2020b; Ray et al., 2022) but substantial progress was made during 2021. Post-consumer face mask recycling has been developed in various countries, including Terracycle in the USA and UK, Plaxtil in France and Vitacore in Canada (Elhawary and Bakthavatchalaam, 2022; Idrees et al., 2022; Ray et al., 2022). One UK newspaper (*The Sun*) notably addressed this issue, promoting the recycling of SM through supermarket collection points (*The Sun*, 10/06/2021)[8] However, this was a minority finding within our dataset.

These findings raise doubts concerning the effective role of newspapers as a "filter" of information (Nerlich and Koteyko, 2010) and as a "limit to misinformation about COVID-19" (Zarocostas, 2020). Despite scientific discussion of the waste associated with SM in the early stages of the Covid-19 pandemic (Allison et al., 2020; Klemes et al., 2020a,b), little of this was presented in newspapers. Greater numbers of scientific papers offered data about the challenges posed by microparticles or chemicals associated with littered FM (Anastopoulos and Pashalidis, 2021; Ma et al., 2021; Selvaranjan et al., 2021; Li et al., 2022)—notably because of their potential to generate microplastics if released into the environment as litter (Ray et al., 2022)—however these only emerged during 2021 and 2022 so environmental issues only played a minor role within the relevant articles in our dataset. As evidence mounted relating to the effects of waste caused by FM (de Albuquerque et al., 2021; Selvaranjan et al., 2021) and potential strategies to use recycled FM in new products (Hartanto and Mayasari, 2021; Rehman and Khalid, 2021), this absence of journalistic interest persisted.

In contrast, our results suggest that British and Irish newspapers prioritized informing the public about the protection provided by FM, especially during the early stage of the pandemic and enforcement of safety measures (April-May 2020). They have thus acted as an effective "platform" for health scientists (Knudsen, 2003; Olausson, 2009; Sanders et al., 2021), whilst being far less effective in considering environmental scientists' statements. However, this limited consideration in newspapers was probably caused by the lack of immediate availability of scientific clear-cut messages. These were delayed due to the time required to produce experiments and publish findings in peer-reviewed journals. This discrepancy may be traced back to a previously documented tendency (Trumbo, 1996) for journalists to prioritize their own views or other concerns over scientific warnings, specifically concerning environmental topics. The newspaper coverage of the health crisis seems to have over-shadowed the coverage of the environmental crisis (consistent with Chen et al., 2022), as opposed to previous findings concerning the impact of crises on coverage of environmental concerns (Anderson, 2009; de-Lima-Santos, 2022).

Further, our results highlight how closely different types of FM are associated with societal aspects. The meaning of "mask" refers to the population as a "uniform" community i.e., people must respect the FM rules under any circumstances. The meaning of "face-covering" seems to depend on the communities described. Relevant

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8 *The Sun* (10/06/2021) URL: https://www.thesun.co.uk/news/9507009/sun-readers-save-planet-changing-habits/.

communities include those with specific health conditions, risky environments, and children.

5. Conclusion

Our analysis suggests that people's choice of single-use SM and subsequent waste caused by FM can, in part, be related to 1. a lack of journalistic representation of the environmental impact of FM, 2. frequent newspaper references to "masks" (as opposed to "face-coverings") during the pandemic, and 3. association of "masks" with collective practices as opposed to an association of "face-coverings" with individual practices.

While "academic nuance" (Bell, 1994; Weingart et al., 2000; Williams Camus, 2015) should be applied to journalistic descriptions of the health and environmental crises, our findings suggest that academic concerns were primarily represented concerning the health aspect, neglecting the environmental implications. Considering the substantial environmental challenges posed by FM waste during the pandemic, it stands to reason that clear-cut media messages would better support the public in adopting sustainable behaviors, averting an additional crisis caused by FM pollution.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Author contributions

AA: Conceptualization, Formal analysis, Investigation, Methodology, Resources, Writing—original draft, Writing—review and editing. TT: Conceptualization, Formal analysis, Methodology, Supervision, Validation, Writing—review and editing. MS: Conceptualization, Formal analysis, Methodology, Validation, Writing—review and editing. NA: Conceptualization, Funding acquisition, Supervision, Validation, Writing—review and editing.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Allison, A. L., Ambrose-Dempster, A., Aparsi, T. D., Bawn, M., Arredondo, M. C., Chau, C., et al. (2020). *The Environmental Dangers of Employing Single-Use Face Masks as Part of a COVID-19 Exit Strategy*. UCL Open: Environment Preprint. p. 44. Available online at: https://ucl.scienceopen.com/hosted-document?doi=10.14324/111.444/000031.v1 (accessed October 31, 2022).

Ammendolia, J., Saturno, J., Brooks, A. L., Jacobs, S., and Jambeck, J. R. (2021). An emerging source of plastic pollution: environmental presence of plastic personal protective equipment (PPE) debris related to COVID-19 in a metropolitan city. *Environ. Poll.* 269, 116160 doi: 10.1016/j.envpol.2020.116160

Anastopoulos, I., and Pashalidis, I. (2021). Single-use surgical face masks as a potential source of microplastics: do they act as a pollutant carrier? *J. Mol. Liq.* 326, 115247. doi: 10.1016/j.molliq.2020.115247

Anderson, A. (2009). Media, politics and climate change: towards a new research agenda. *Sociol. Comp.* 3:166–182. doi: 10.1111/j.1751-9020.2008.00188.x

Baker, P., Gabrielatos, C., Khosravinik, M., and Krzyzanowski, M. (2008). A useful methodological synergy? Combining critical discourse analysis and corpus linguistics to examine discourses of refugees and asylum seekers in the UK press. *Discourse Soc.* 19, 273–306. doi: 10.1177/0957926508088962

Bell, A. (1994). Climate of opinion: Public and media discourse on the global environment. *Discourse Soc.* 5, 33–64. doi: 10.1177/0957926594005001003

Bhattacharjee, S., Bahl, P., Chughtai, A. A., and MacIntyre, C. R. (2020). Last-resort strategies during mask shortages: optimal design features of cloth masks and decontamination of disposable masks during the COVID-19 pandemic. *BMJ Open Respirat. Res.* 7, e000698. doi: 10.1136/bmjresp-2020-000698

Chen, K., Molder, A., Duan, Z., Boulianne, S., Eckart, C., Mallari, P., et al. (2022). How climate movement actors and news media frame climate change and strike: evidence from analyzing Twitter and news media discourse from 2018 to 2021. *Int. J. Press Pol.* 28, 194016122211064. doi: 10.1177/19401612221106405

Chowdhury, H., Chowdhury, T., and Sait, S. M. (2021). Estimating marine plastic pollution from COVID-19 face-masks in coastal regions. *Marine Poll. Bull.* 168, 112419. doi: 10.1016/j.marpolbul.2021.112419

Ciszek, E. (2017). Activist strategic communication for social change: a transnational case study of lesbian, gay, bisexual, and transgender activism. *J. Commun.* 67, 702–718. doi: 10.1111/jcom.12319

Cohen, J., and Rogers, Y. (2020). Contributing factors to personal protective equipment shortages during the COVID-19 pandemic. *Prevent. Med.* 141, 106263. doi: 10.1016/j.ypmed.2020.106263

de Albuquerque, P., Dhadwal, M., Dastyar, W., Azizi, S. M. M., Karidio, I., Zaman, H., et al. (2021). Fate of disposable face masks in high-solids anaerobic digestion: experimental observations and review of potential environmental implications. *Case Stud. Chem. Environ. Eng.* 3:100082. doi: 10.1016/j.cscee.2021.100082

de León, E., Makhortykh, M., Gil-Lopez, T., Urman, A., and Adam, S. (2022). News, threats, and trust: How COVID-19 news shaped political trust, and how threat perceptions conditioned this relationship. *Int. J. Press Pol.* 1–23. doi: 10.1177/19401612221087179. [Epub ahead of print].

De-la-Torre, G. E., Dioses-Salinas, D. C., Pizarro-Ortega, C. I., Severini, M. D. F., López, A. D. F., Mansilla, R., et al. (2022). Binational survey of personal protective equipment (PPE) pollution driven by the COVID-19 pandemic in coastal environments: abundance, distribution, and analytical characterization. *J. Hazard. Mater.* 426, 128070. doi: 10.1016/j.jhazmat.2021.128070

de-Lima-Santos, M. (2022). Setting an agenda to tackle environmental issues with data and collaboration. *J. Pract.* 16, 1–21. doi: 10.1080/17512786.2022.2031256

Eikenberry, S., Mancuso, M., Iobi, E., Phan, T., Eikenberry, K., Kuang, Y., et al. (2020). To mask or not to mask: modelling the potential for face mask use by the general public to curtail the COVID-19 pandemic. *Infect. Dis. Model.* 5:293–308. doi: 10.1016/j.idm.2020.04.001

Elhawary, O., and Bakthavatchalaam, V. (2022). "What can be done about the discarded face mask pandemic? An innovative engineering solution," in *Science Policy Brief for the 7th Multistakeholder Forum on Science Technology and Innovation for the SDGs, 5-6 May 2022, United Nations, Held Online*. Available online at: https://sdgs.un. org/tfm/STIForum2022. PDF: https://sdgs.un.org/sites/default/files/2022-05/3.2.1-65-Omar%20-recycling%20face%20masks.pdf

Fernández-Arribas, J., Moreno, T., Bartrol,í R., and Eljarrat, E. (2021). COVID-19 face masks: a new source of human and environmental exposure to organophosphate esters. *Environ. Int.* 154, 106654. doi: 10.1016/j.envint.2021.106654

France, R. (2022). First landscape-scale survey of the background level of COVID-19 face mask litter: Exploring the potential for citizen science data collection during a 'pollution pilgrimage' of walking a 250-km roadside transect. *Sci. Total Environ.* 816, 151569. doi: 10.1016/j.scitotenv.2021.151569

Gillings, M., Mautner, G., and Baker, P. (2023). *Corpus-Assisted Discourse Study*. Cambridge: Cambridge University Press.

Grunnawalt, J. (2021). The villain unmasked: COVID-19 and the necropolitics of the anti-mask movement. *Disabil. Stud. Quat.* 41, 343. doi: 10.18061/dsq.v41i3.8343

Hanne, M. (2022). How we escape capture by the "war" metaphor for covid-19. *Metaphor Symbol* 37, 88–100. doi: 10.1080/10926488.2021.1935261

Hartanto, B., and Mayasari, D. (2021). Environmentally friendly non-medical mask: An attempt to reduce the environmental impact from used masks during COVID-19 pandemic. *Sci. Total Environ.* 760, 144143. doi: 10.1016/j.scitotenv.2020.144143

Hearne, B., and Nino, M. (2021). Understanding how race, ethnicity, and gender shape mask-wearing adherence during the COVID-19 pandemic: evidence from the COVID Impact Survey. *J. Racial Ethnic Health Disparit.* 9, 176–183. doi: 10.1007/s40615-020-00941-1

Hunston, S. (2002). *Corpora in Applied Linguistics*. Cambridge: Cambridge University Press. doi: 10.1017/CBO9781139524773

Idrees, M., Akbar, A., Mohamed, A. M., Fathi, D., and Saeed, F. (2022). Recycling of waste facial masks as a construction material, a step towards sustainability. *Materials* 15, 1810. doi: 10.3390/ma15051810

Il Kwak, J., and An, Y.-J. (2021). Post-COVID-19 pandemic: biofragmentation and soil ecotoxicalogical effects of microplastics derived from face masks. *J. Hazardous Mat.* 416, 126169. doi: 10.1016/j.jhazmat.2021.126169

Kahn, K., and Money, E. (2021). (Un)masking threat: racial minorities experience race-based social identity threat wearing face masks during COVID-19. *Group Proc. Intergroup Rel.* 25, 871–891. doi: 10.1177/1368430221998781

Kilgarriff, A. (2014). *SketchEngine*. Available online at: sketchengine.eu (accessed February 15, 2022).

Klemes, J. J., Fan, Y. V., and Jiang, P. (2020b). Energy and environmental footprints of COVID-19 fighting measures – PPE, disinfection, supply chains. *Energy* 211, 118701. doi: 10.1016/j.energy.2020.118701

Klemes, J. J., Fan, Y. V., Tan, R. R., and Jiang, P. (2020a). Minimising the present and future plastic waste, energy and environmental footprints related to COVID-19. *Renew. Sustain. Energy Rev.* 127, 109883. doi: 10.1016/j.rser.2020.109883

Knudsen, S. (2003). Scientific metaphors going public. *J. Pragmat.* 35, 1247–1263. doi: 10.1016/S0378-2166(02)00187-X

Kutralam-Muniasamy, G., and Shruti, V.-C. (2022). The case of "public congregation vs. COVID-19 PPE pollution": evidence, lessons, and recommendations from the annual pilgrimage to the Catholic Holy Site in Mexico City, Mexico. *Sci. Total Environ.* 821, 153424. doi: 10.1016/j.scitotenv.2022.153424

Lee, A. W. L., Neo, E. R. K., Khoo, Z.-Y., Yeo, Z., Tan, Y. S., Chng, S., et al. (2021). Life cycle assessment of single-use surgical and embedded filtration layer (EFL) reusable face mask. *Resources Conserv. Recycl.* 170, 105580. doi: 10.1016/j.resconrec.2021.105580

Li, B., Huang, Y., Guo, D., Liu, Y., Liu, Z., Han, J.-C., et al. (2022). Environmental risks of disposable face masks during the pandemic of COVID-19: challenges and management. *Sci. Total Environ.* 825, 153880. doi: 10.1016/j.scitotenv.2022.153880

Liu, R., and Mabury, S. A. (2021). Single-use face masks as a potential source of synthetic antioxidants to the environment. *Environ. Sci. Technol. Lett.* 8, 651–655. doi: 10.1021/acs.estlett.1c00422

Lyons, J. (2012). *Linguistic Semantics: An Introduction*. Cambridge: Cambridge University Press.

Ma, J., Chen, F., Xu, H., Jiang, H., Liu, J., Li, P., et al. (2021). Face masks as a source of nanoplastics andmicroplastics in the environment: quantification, characterization, and potential for bioaccumulation. *Environ. Pollut.* 288, 117748. doi: 10.1016/j.envpol.2021.117748

MacLin, M., and Herrera, V. (2006). The criminal stereotype. *N. Am. J. Psychol.* 8, 197–208. Retrieved from: https://www.proquest.com/scholarly-journals/criminal-stereotype/docview/198021730/se-2

Morgana, S., Casentini, B., and Amalfitano, S. (2021). Uncovering the release of micro/nanoplastics from disposable face masks at times of COVID-19. *J. Hazard. Mater.* 419, 126507. doi: 10.1016/j.jhazmat.2021.126507

Nerlich, B., and Koteyko, N. (2010). Carbon gold rush and carbon cowboys: a new chapter in green mythology? *Environ. Commun. J. Nat. Cult.* 4, 37–53. doi: 10.1080/17524030903522389

Niniimaki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., and Gwilt, A. (2020). The environmental price of fast fashion. *Nat. Rev. Earth Environ.* 1, 189–200. doi: 10.1038/s43017-020-0039-9

Olausson, U. (2009). Global warming – global responsibility? Media frames of collective action and scientific certainty. *Public Understand. Sci.* 18, 421–436. doi: 10.1177/0963662507081242

Pofi, M., and Wing Fai, L. (2021). Responses to health risk and suffering: 'China' in the Italian media discourses during the early stage of the COVID-19 pandemic. *Media Cult. Soc.* 4, 820–836. doi: 10.1177/01634437211053770

Prata, J., Patricio-Silva, A., Duarte, A. C., and Rocha-Santos, T. (2021). Disposable over reusable face masks: public safety or environmental disaster? *Environments* 8, 31. doi: 10.3390/environments8040031

Ray, S. S., Lee, H. K., Huyen, D. T. T., Chen, S.-S., and Kwon, Y.-N. (2022). Microplastics waste in the environment: a perspective on recycling issues from PPE kits and face masks during the COVID-19 pandemic. *Environ. Technol. Innov.* 26, 102290. doi: 10.1016/j.eti.2022.102290

Rehman, Z., and Khalid, U. (2021). Reuse of COVID-19 face mask for the amelioration of mechanical properties of fat clay: a novel solution to an emerging waste problem. *Sci. the Total Environ.* 794, 148746. doi: 10.1016/j.scitotenv.2021.148746

Roberts, K., Phang, S., Williams, J. B., Hutchinson, D. J., Kolstoe, S. E., et al. (2022). Increased PPE litter as a result of COVID-19 measures. *Nat. Sustain.* 5, 272–279. doi: 10.1038/s41893-021-00824-1

Rodríguez, N. B., Formentini, G., Favi, C., and Marconi, M. (2021). Engineering design process of face masks based on circularity and life cycle assessment in the constraint of the COVID-19 pandemic. *Sustainability* 13, 4948. doi: 10.3390/su13094948

Ryan, P., Maclean, K., and Weideman, E. (2020). The impact of the COVID-19 lockdown on Urban Street Litter in South Africa. *Environ. Proc.* 7:1303–1312 doi: 10.1007/s40710-020-00472-1

Saberian, M., Li, J., Kilmartin-Lynch, S., and Boroujeni, M. (2021). Repurposing of COVID-19 single-use face masks for pavements base/subbase. *Sci. Total Environ.* 769, 145527. doi: 10.1016/j.scitotenv.2021.145527

Sabucedo, J.-M., Alzate, M., and Hur, D. (2020). Covid-19 and the metaphor of war. *Int. J. Soc. Psychol.* 35, 618–624. doi: 10.1080/02134748.2020.1783840

Salama, A. (2011). Ideological collocation and the recontextualization of Wahhabi-Saudi Islam post 9/11: a synergy of corpus linguistics and critical discourse analysis. *Disc. Soc.* 22, 315–342. doi: 10.1177/0957926510395445

Saliu, F., Veronelli, M., Raguso, C., Barana, D., Galli, P., Lasagni, M., et al. (2021). The release process of microfibers: from surgical face masks into the marine environment. *Environ. Adv.* 4, 100042 doi: 10.1016/j.envadv.2021.100042

Sanders, J., Tosi, A., Obradovic, S., Miligi, I, and Dilaney, L. (2021). Lessons from lockdown: media discourse on the role of behavioural science in the UK COVID-19 response. *Front. Psychol.* 12, 647348. doi: 10.3389/fpsyg.2021.647348

Schafer, M., and Schlichting, I. (2014). Media representations of climate change: a meta-analysis of the research field. *Environ. Commun.* 8, 142–160. doi: 10.1080/17524032.2014.914050

Selvaranjan, K., Navaratnam, S., Rajeev, P., and Ravintherakumaran, N. (2021). Environmental challenges induced by extensive use of face masks during COVID-19: a review and potential solutions. *Environ. Chal.* 3, 100039. doi: 10.1016/j.envc.2021.100039

Sinclair, J. (1991). *Corpus, Concordance, Collocation*. Oxford: Oxford University Press.

Siwal, S. S., Chaudhary, G., Saini, A. K., Kaur, H., Saini, V., Mokhta, S. K., et al. (2021). Key ingredients and recycling strategy of personal protective equipment (PPE): towards a sustainable solution for the COVID-19 like pandemics. *J. Environ. Chem. Eng.* 9, 106284. doi: 10.1016/j.jece.2021.106284

Stefanowitsch, A. (2020). *Corpus linguistics: A guide to the methodology*. Textbook in Language Sciences 7. Berlin: Language Science Press.

Steir-Livny, L. (2021). Traumatic past in the present: COVID-19 and Holocaust memory in Israeli media, digital media, and social media. *Media Cult. Soc.* 44, 464–478. doi: 10.1177/01634437211036997

Tallic, S., Shah, S., Wild, H., Gasevic, D., Maharaj, A., Ademi, Z., et al. (2021). Effectiveness of public health measures in reducing the incidence of covid-19 SARS-CoV-2 transmission, and COVID-19 mortality: systematic review and meta-analysis. *BMJ* 375, e068302. doi: 10.1136/bmj-2021-068302

Tognini Bonelli, E. (2001). *Corpus Linguistics at Work*. Amsterdam, PA: John Benjamins.

Trumbo, C. (1996). Constructing climate change: claims and frames in US news coverage of an environmental Issue. *Public Understand. Sci.* 5, 269–283 doi: 10.1088/0963-6625/5/3/006

UK Government (2020). *Regulatory Status of Equipment Being Used to Help Prevent Coronavirus (COVID-19)*. Available online at: https://www.gov.uk/guidance/regulatory-status-of-equipment-being-used-to-help-prevent-coronavirus-covid-19#face-masks-and-face-coverings (accessed November 26, 2021).

Wang, Z., An, C., Chen, X., Lee, K., Zhang, B., and Feng, Q. (2021). Disposable masks release microplastics into the aqueous environment with exacerbation by natural weathering. *J. Hazard. Mater.* 417, 126036. doi: 10.1016/j.jhazmat.2021.126036

Weingart, P., Engels, A., and Pansegrau, P. (2000). Risks of communication: discourses on climate change in science, politics and the mass media. *Public Understand. Sci.* 9, 261–283. doi: 10.1088/0963-6625/9/3/304

WHO (2020). *Advice on the Use of Masks in the Community, During Home Care and in Health Care Settings in the Context of the Novel Coronavirus (?2019-nCoV)? Outbreak: Interim Guidance, 29 January 2020*. Available online at: https://apps.who.int/iris/handle/10665/330987 (accessed October 24, 2022).

Wicke, P., and Bolognesi, M. (2020). Framing COVID-19: how we conceptualize and discuss the pandemic on Twitter. *PLoS ONE* 15, e0240010. doi: 10.1371/journal.pone.0240010

Williams Camus, J. (2015). "Metaphor, news discourse and knowledge" In *Metaphor in Specialist Discourse*, eds. B. J. Hermann and T. Berber Sardinha (Amsterdam, PA: John Benjamins), 245–70.

Wu, H.-L., Huang, J., Zhang, C. J. P., He, Z., and Ming, W.-K. (2020). Facemask shortage and the novel coronavirus disease (COVID-19) outbreak: reflections on public health measures. *EClinical Med.* 21, 100329. doi: 10.1016/j.eclinm.2020.100329

Xiao, R., and McEnery, T. (2006). Collocation, semantic prosody, and near synonymy: A cross-linguistic perspective. *Appl. Linguist.* 27, 103–129. doi: 10.1093/applin/ami045

Xue, Y., and Xu, Q. (2021). An ecological discourse analysis of news coverage of COVID-19 in China in the Times and the New York Times. *J. World Lang.* 7, 80–103. doi: 10.1515/jwl-2021-0005

Zarocostas, J. (2020). How to fight an infodemic. *Lancet* 395, 676. doi: 10.1016/S0140-6736(20)30461-X