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Social media engagement in health and climate change: an exploratory analysis of Twitter

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SOCIAL MEDIA ENGAGEMENT IN HEALTH AND CLIMATE CHANGE: AN EXPLORATORY ANALYSIS OF TWITTER

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Abstract

Social media are increasingly used by the public to share information and opinions. This study explores social media engagement in health and climate change through an analysis of English-language posts on Twitter, one of the most widely-used platforms. We searched Twitter from 3rd April 2023 to 11th May 2023 for posts related to climate change using climate-related textwords and hashtags; we then used health keywords ('health', 'wellbeing', 'illness', 'illnesses', 'disease', 'death') to identify posts related to health. Focusing on posts from general public users, we investigated the proportion of climate change posts referring to health and, for a random sample of these tweets, undertook a content analysis to identify the ways in which climate change and health were represented. The content analysis drew on media research on 'framing', a selective process through which particular aspects of an issue – for example, its causes, impacts and solutions – are highlighted. 668,810 posts related to climate change were posted during the study period. Health-related text words were included in 2.3% (15,434) of these posts. The content analysis pointed to two divergent frames. The first frame represents climate change as real, with real effects on people's health. The second frame portrays climate change as a hoax, with hoax-generated health effects. While the 'reality' frame does not engage with the hoax frame, the latter provides an insistent counter-narrative that questions trust in mainstream science and government policy. Neither frame engages with people's experiences of health and climate change. In conclusion, our study points to low levels of engagement in health in a key forum for public discussions about climate change. It also asks whether the failure of the 'reality' frame to engage either with people's lived experiences or with hoax framings may be contributing to a polarised debate about climate change and health and hindering consensus-building.

Key words: climate policy, frames, Net Zero, public

Introduction

Focusing on the health dimensions of climate change is advocated as a way of engaging the public in climate change (1, 2), an engagement essential for an effective policy response (3) (4). A health framing of climate change is seen as particularly important in high-income countries whose carbon-intensive lifestyles

have driven climate change (5) but which have been relatively protected from its environmental and economic impacts (6). G7 countries, including Canada, the UK and the US (7-9), are committed to net zero greenhouse gas emissions by 2050; drawing attention to the health benefits of such policies may help to support the case for urgent action (1, 10, 11).

Our study explores engagement in health and climate change on social media, a networked public sphere providing online modes of interaction. These platforms are widely used (over 80% and 70%, respectively, of UK and US adults are active social network users) (12) and are transforming the way the public engages with health (13) and climate change (14). Together with established media outlets like newspapers and television, social media has become an integral part of an interconnected ecosystem through which the public can access information and share opinions. It has therefore become an increasing focus of inquiry. Studies of social media often draw on wider research on 'framing', a process through which audiences are offered 'interpretive packages' (15) in which particular aspects of an issue – for example, its causes, impacts and solutions – are highlighted ('put in the frame') and alternative ways of understanding the issue are obscured.

Twitter (renamed X in July 2023) and Facebook are the most widely-used social media source of news (16), with Twitter having a particular focus on climate change and environmental issues (17). Users of the micro-blogging platform can post brief messages ('tweets') of up to 280 characters and assign 'hashtags' (e.g., #climate change) to indicate their subject matter. In 2023, Twitter had over 19 million UK and 240 million US users (18, 19). The social profile of UK and US Twitter users broadly matches that of social media users overall, but Twitter has a larger share of male, urban and higher-income users (20, 21).

While social media engagement in climate change has been widely researched (14, 17, 22-24), we located only one study (of Greek-language Twitter users) (25) exploring engagement in health and climate change. Our study of Twitter addresses this gap. Focusing on posts from general public users, we firstly investigate the proportion of tweets on climate change that engage with health. Secondly for this subset of tweets, we identify the frames in which health and climate change are set. Our study was conducted after Elon Musk's acquisition of Twitter in October 2022 but before changes to the platform reduced access to the platform for users and researchers and Twitter was renamed 'X' (26).

Methods

We searched Twitter from 21 March to 11 May 2023. We avoided the months surrounding the annual meeting of the Conference of the Parties (COP) to the UN Convention on Climate Change (UNFCCC), the major international climate change event associated with heightened media and political engagement in climate change (27, 28). We used climate-related textwords ('climate change', 'climatechange', 'global warming', 'globalwarming', 'net zero', 'netzero') and hashtags

(#climatechange, #globalwarming and #netzero). We avoided terms and hashtags that retrieved polarised views (e.g., #climatehoax, #climatescam, #endoftheworld, #climate catastrophe, #climate crisis). Searches were undertaken using Mozdeh software (29). To focus on posts from general public users, we filtered out high-volume users (≥500 posts a week; most users tweet a few times a day or less) (30), retweets and duplicate tweets. Mozdeh software was used to identify the country of those posting the tweets; this uses location information matched to country names and major cities. Only a small proportion of Twitter users list their location (approximately 26%) (31).

To identify the proportion of climate change tweets that engage with health (aim 1), we used topic modelling (32) to develop search queries related to 'health' (keywords: 'health', 'wellbeing', 'illness', 'illnesses', 'disease', 'death') (10). We measured the number of health-related posts as a proportion of all climate change tweets. Where users opted into location tracking or added their location details to their posts, we estimated the distribution of posts by users' country of residence. To identify the frames in which health and climate change are set (aim 2), we undertook a content analysis of a random sample of 200 health-related posts. The analysis was informed by qualitative thematic analysis, an inductive method that involves coding each item of data to identify 'patterns of meaning' within and across the dataset that cohere into broader organising concepts (33). Codes were developed for a random sample of 100 tweets by one author (HG) to generate the initial coding schema; the schema was then tested using a further sample of 100 tweets and reviewed by both authors.

Results

668,810 climate-change related posts were posted during the study period. The search terms retrieving the highest number of posts were 'climate change' (62%), 'global warming' (15%) and 'net zero' (10%), followed by the hashtags for these terms (supplementary information: Table S1). For the majority of posts, the user's country of residence could not be identified. For the subset (24%; 163,303) where this was possible, the largest group were from the US (42%; 68,097), followed by the UK (22%; 36564) and Canada (9%; 15,012).

 (i) Engagement in health in tweets on climate change

Of the climate change posts, 2.3% (15,434) included one or more of health keywords. 'Health' was the search term that retrieved the largest proportion of health-related posts (60%), followed by 'death' (27%) and 'disease' (13%) (Table S2).

 (ii) Framings of health and climate change

The content analysis generated a set of reciprocal codes (climate is happening/not happening; climate change is health-damaging/not health-damaging; action on climate change is required/opposed) linked to two broader frames: climate change and its health effects are real and are a hoax (Figure 1; see Table S3 for the coding schema). A small proportion (12%; n=24) could not be placed in either of frame

(Table S4). Of the remainder, 77% (n=135) adopted a 'reality' frame and 23% (n=41) a hoax frame.

<u>Climate change and its health effects are real</u>. Tweets generally adopted a neutral and fact-based reporting style ('climate change is real, and…it is one of the most serious health threats to humanity'; 'impacts of climate change on human health include direct heat deaths…especially old, young and sick') (Figure 1). However, some tweets used more emotive language ('climate change is here, it's catastrophic'; 'we are facing a death sentence… we are all walking in our graves'). Tweets referred to both the physical and mental health impacts of climate change; extreme weather events (floods, heat/heatwave, drought) were included in 16% of tweets (Figure 1 and Table S3).

Over 40% of tweets referred to actions to address climate change and its health effects. Some were generic calls for action: 'we must act now', 'change our way of life', 'let's invest in a cleaner, healthier future'. Other tweets included more specific actions by individuals and communities ('replacing car trips with an ebike', 'taking the government to court') and by governments. Examples of the latter include: 'planting urban trees and adding green spaces is the best way to improve health of city residents', 'governments must act now to prevent worse impacts on public health', 'the solution to global warming is to have very strict laws on pollution. By making it virtually impossible to pollute, we automatically reduce CO_2 levels, improve human health'.

Underpinning the 'reality' frame is an implicit trust in science and the potential for individual action and climate policies to yield benefits for health. As Figure 1 indicates, tweets are anchored in evidence of climate change and its health effects and encourage individual and societal actions to ameliorate these impacts. None of this group of tweets engage with alternative framings of climate change and health.

<u>Climate change and its health effects are a hoax.</u> The second frame is constructed in opposition to the more dominant 'reality' frame. Climate change is a hoax, and any putative health effects of climate change are the result of a gullible public being taken in (Figure 1 and Table S3). The focus of the tweets was on the mental health impacts of what is described as 'the false narrative about climate change' ('the crisis is the mental health of the impressionable who believe the nonsense of climate change', 'it's just another way to traumatise the public. As if we don't have enough mental illness with[out] the endless barrage of climate change hysteria'). Physical health impacts were not discussed, and no tweets referred to extreme weather events.

Tweets often adopted a polemical style, using combative language to ridicule the 'reality' frame ('those concerned about climate change were more likely to have higher psychological distress, low wellbeing and rate their mental health as "poor or fair". LOL, I can believe that. You're stressing these poor dopes to death with this scam').

Underpinning the frame is an explicit distrust of science and government. Thus 'climate scientists are …dumb and corrupt people. Now they are putting together

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public health (oh, boy) and climate'. With respect to government, 'you leaders bring nothing but misery, poverty & death with your stupid Climate Change policies. It's a scam' that is 'forcing people to accept the pack of lies about climate change...mental health is on the rise. Our government (both sides) are corrupt and thinking only of themselves'. Where action is advocated, it is to put an end to the hoax ('the mental health issue with climate change is the hysteria that is encouraged by activists…the propaganda onslaught needs to be stopped', 'can we prosecute the scaremongers?').

Convergences between the two frames. Despite their contrasting perspectives on climate change and health and on trust in science and government, the frames share similarities. Firstly, both present a picture of society under threat. In the reality frame, 'we are facing a death sentence' with climate change 'causing costs to rise [and] diseases to spread'. In the hoax frame, 'they want you all scared to death of climate change!' and 'people are genuinely scared stiff'). Secondly, neither frame engages with people's lived experiences. Tweets representing climate change and its health effects as real, like those disputing this framing, do not articulate the views and experiences of individuals and communities whose health is being affected by the reality or the hoax of climate change. Neither provides a platform for communicating the perspective of members of the public on climate change and health. Instead, the tweets adopt the standpoint of a detached observer, with people represented in the form of 'disease' and 'death' (the first frame) and 'poor dopes', 'the impressionable' 'the masses' (the second frame).

Figure 1: examples of health-related posts

Frame 1: Climate change and its health effects are real

The negative effects of climate change on Kenya's economy and people are profound, with droughts and floods causing food shortages, water scarcity, and public health emergencies.

I predict people will do the same in 30 years time when the impacts of climate change are more likely to be a real threat to their wellbeing. "How could we possibly have known?!?!" - well, I don't know... Maybe you could have listened to people that actually studied this stuff who warned you. Oh well!

The effects of global warming can already be seen in rising costs and the spread of diseases.

We are facing a death sentence. We are all going to die If we don't change our way of life.

Direct mortality from heat-related causes, such as heat stroke and cardiovascular disease, especially in the elderly, young, and ill, are clear effects of climate change on human health.

"#ClimateChange doesn't just cause brand new health problems, it also exacerbates pre-existing health issues. In reality, people who suffer from chronic illnesses are more vulnerable since extreme weather events can disrupt their treatment.

Climate change is real, it's catastrophic and a threat to our planet and all of its inhabitants (including humans). Urban tree planting and increasing green spaces are the most effective ways to improve the health of urban residents. Let's get to action!

More than two thousand women are suing the Swiss government on the grounds that its #ClimateChange policy infringes on their fundamental rights to life and health.

On Friday, experts urged governments to take immediate action to stop the negative effects of climate change on public health.

The solution to combating global warming is to have very strict pollution laws. We can automatically lower CO2 levels and so improve human health by making it virtually impossible to pollute, which is both harmful in the short-term and the long-term.

The number of car trips that people can replace with an ebike surprises most people. You can help to combat climate change (and improve your mental health and make your community safer) by reducing SOME of your car journeys, even if you don't replace all of your trips.

Without sufficient funding for research and action on air pollution, we run the risk of exacerbating #ClimateChange and putting future generations health and wellbeing at risk. Invest in a cleaner, safer future.

<u>Frame 2: Climate change and its health effects are a hoax</u>

Yet another attempt to traumatise the public. As if there isn't enough mental health problems to deal with with the endless barrage of global warming hysteria.

Flying under the green thing and climate change. Climate scientists are failed real scientists. They are stupid and corrupt. They are now combining public health (yikes!) and climate change.

The constant fearmongering about global warming is really taking a toll on our mental health, and it's got to stop.

Climate change is your supposed no 1 killer followed by suicide at no 2 because academics (and I use the word very loosely) have convinced gullible fools that the world hates them (oh boy).

"Global warming is bad for mental health" NO! Constant fear mongering is bad for our mental health and it needs to be stopped right now!

The crisis is in the mental state of impressionable people who believe in this climate scam. Some of them are scared stiff genuinely.

What we call "climate change" has had no impact on any kind of vector or disease type. Climate change is a scam and Bill Gates is a halfwit.

Forcing people to accept the pack of lies about climate change….Mental health issues are increasing, but why? Our government (both political parties) is corrupt and only cares about themselves. You need to wake up!

You leaders have brought nothing but misery, suffering, poverty and death with your foolish climate change energy poverty policies that are driving up Inflation and creating a cost of living crisis, making it too expensive to live! It's a total scam

They're lying to you. There is no emergency, no crisis #NetZero is unnecessary bollocks, dangerous to your health and wellbeing It's a scam.

Climate change isn't causing mental health issues – the doom mongers are. It is all to do with the crazy propaganda that's coming out of the activists. Maybe it's time to stop the scaremongering and get some therapy instead of more publicity.

A lot of young people don't think they'll make it to middle age because they think climate change will kill them first. It's no surprise they have mental health issues and think they're on death row. Can we take the scammers to court for child abuse?

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Discussion

Social media platforms are an increasingly important arena in which the public accesses and circulates information and opinions. Like traditional media outlets, they provide the public with different ways of understanding complex issues like climate change. These different frames 'tell the audience different stories' about climate change (34). Our exploratory study examined the level and types of engagement in health and climate change on Twitter.

Only a small proportion of climate change posts engaged with health. Across a six-week period in 2023, 2.3% of tweets on climate change referred to health (health, disease, death, illness). A study of Greek-language tweets from 2013 to 2023 similarly found that the large majority of climate change tweets did not engage with health (25). The content analysis suggests that Twitter is a polarised space for engagement in health and climate change, dominated by two competing frames. In the first frame, climate change is real and is having real effects on people's health, with action at all levels of society offering the potential to limit climate change and secure benefits for people's health. The frame is anchored in a trust of science and government, institutions on which effective action depends. In the second frame, climate change is a hoax, and any health effects are hoax-generated. Where action is advocated, it is to end the hoax and to silence its perpetrators. The hoax frame draws on a wider populist ideology in which 'the people' are pitted against 'the elite' (35), with various corrupt and powerful groups (governments, scientists, corporate bosses) selling false narratives about climate change which vulnerable people are believing. While the first frame does not engage with the second frame, the hoax frame is built around a rejection of the 'reality' frame: its counter-narrative seeks to disrupt trust in mainstream science and government and undermine the case for climate action. As this suggests, social media engagement in health and climate change is a site in which alternative framings of climate change are played out, with these alternative framings supported by a wider polarisation of climate change discourses on social media (34, 36-39).

In the random sample of tweets in our study, none included personal experiences of climate change. This stands in contrast to the public's wider use of Twitter, which has been found to provide a safe and anonymous space for sharing health experiences and connecting with others with similar experiences (40, 41).

Some limitations of our study should be noted. Firstly, it is possible that the search terms resulted in a sample of Tweets in which sceptical voices were over-represented. We excluded terms like '#climatehoax' and '#climatescam' (along with terms that accorded with the first frame like '#climate catastrophe' and '#climate crisis'). However, to capture engagement with health in the context of climate policy, we included 'Net Zero' terms. Net Zero is an increasingly politicised term, signifying both support for governments' climate policy (7-9) and a rejection of these policies (42). Rerunning the analysis without the Net Zero terms left the proportion of health-related tweets unchanged.

Secondly, the dataset is of Twitter posts, not Twitter users. The findings are therefore not comparable to those from surveys of the public. However, qualitative studies in the US, UK and Canada, the countries of residence for most users for whom locational data were available, point to relatively low levels of public engagement in the health dimensions of climate change (43-46). Wider evidence suggests that a key factor is the public's lack of knowledge of the type and severity of climate change's impact on people's health (47) and points to the potential for testing and refining public health messaging around climate change, including targeted messages for those unconcerned and sceptical about climate change (48) (49).

Thirdly, we did not include visual images, an important part of climate change and health communication, particularly on social media (50, 51). However, studies of visual imagery in climate change and health-related tweets suggest that visual and textual content are highly correlated (52, 53). Finally, the timing of the study may have resulted in a higher proportion of sceptical content. The acquisition of Twitter by Elon Musk in October 2022 and the consequent changes in content moderation have been associated with an increase in right-wing content and an associated shift from a reported left-leaning bias (54). A content analysis conducted prior to October 2022 may have found a smaller proportion of 'hoax' frames; however, changes to research access to Twitter meant a comparison with earlier content could not be undertaken. Nonetheless, as noted above, Twitter has long been a site of 'contestation over climate change' (17), particularly between scientific and hoax discourses (34, 37). In addition, it has been argued that, while Twitter is an arena in which opposing viewpoints are represented and amplified, it is not their source. The origins lie instead in a broader erosion of public trust in government and science (39, 55).

Conclusion

Linking climate change to people's health is seen as a way of increasing public awareness of climate change and building support for climate action. As advocates of this approach have argued, health is 'the way we primarily and most intimately' (2) experience climate change. Social media are an integral part of the contemporary media landscape and a forum in which the public can access information and share opinions. Our study explored engagement in climate change and health on Twitter.

Two conclusions for policy can be drawn from our study. Firstly, there is relatively little engagement with health and climate change on social media: despite being seen as way of making climate change personal, only a small proportion of climate change tweets referred to health. Limited engagement in health may be linked to the 'threat narrative' adopted by the dominant frames: both portray a vision of societies in crisis in which people's health is at risk from forces beyond their control. Shifting from these negative narratives to more positive scenarios may be more effective in building public engagement and policy support (56).

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Secondly, our study raises questions about the science-based frame that represents climate change and its health effects as real. While most tweets adopt this frame, none engage with alternative frames: the tweets simply convey information and recommend actions. In contrast, the hoax frame is actively constructed in opposition to the reality frame, depicting it as 'fake' 'propaganda' and 'scaremongering'. The 240-character limit means that a tweet can only tell part of the story. Nonetheless, the failure to discuss hoax framings may be inadvertently reproducing a polarised debate about climate change and health and hindering consensus-building (57). The 'reality' frame, like the hoax frame, also fails to engage with lived experiences of climate change and health. Personal accounts are conspicuous by their absence. Yet broader evidence suggests that direct experience of climate change events, for example flooding, is linked to greater concern about climate change and perceived vulnerability to its health effects (58-60). 'Reality' frames that drew on people's experiences, including accounts of the physical and mental health impacts of climate-related exposures, may help to increase engagement with the health dimensions of climate change.

Although exploratory, the study provides insights into engagement in health and climate change on social media, an increasingly important forum for public interaction and opinion-sharing. It found a low level of engagement and the dominance of two divergent representations of climate change and health. By noting the absence of people's experiences of climate change and health, the study points to ways in which social media could be more effectively used as a vehicle for increasing public awareness of what is widely recognised to be the major public health challenge of the 21st century.

Ethics statement

Data Availability Statement

The data that support the findings of this study are publicly available on Twitter. Copies of the tweets cannot be provided as this would breach Twitter Terms of Service and would prevent anonymity of the people posting in our sample. Twitter IDs are available on request from the authors for those wishing to hydrate them; however, this cannot be applied to those without a paid subscription to Twitter or to those Tweets deleted or made private since the time of this study. All example Tweets provided in the manuscript are paraphrased or they were phrases used in multiple tweets, thus protecting the anonymity of the person tweeting.

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