



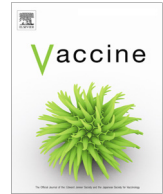
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“Any idea how fast ‘It’s just a mask!’ can turn into ‘It’s just a vaccine!’”: From mask mandates to vaccine mandates during the COVID-19 pandemic

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ABSTRACT

Protests starting in the summer of 2020, notably in the US and UK, have brought together two constituencies: pre-existing anti-vaccine groups and newly formed oppositional COVID-19 groups. The oppositional COVID-19 groups vary in composition and nature, but the central focus is a disagreement about the seriousness and threat of COVID-19 and with the public health measures to control COVID-19. What unites many disparate interests is an aversion to mandates. The compulsion to undertake particular public health activities such as mask-wearing and vaccination is a complex topic of public attitudes and beliefs alongside public health goals and messaging. We aim to analyse social media discussions about facemask wearing and the adoption of potential vaccines for COVID-19.

Using media monitoring software MeltwaterTM, we analyse English-language tweets for one year from 1st June 2020 until 1st June 2021. We pay particular attention to connections in conversations between key topics of concern regarding masks and vaccines across social media networks. We track where ideas and activist behaviours towards both health interventions have originated, have similarities, and how they have changed over time.

Our aim is to provide an overview of the key trends and themes of discussion concerning attitudes to and adoption of health measures in the control of COVID-19 and how publics react when confronted with mandatory policies. We draw on an already extensive literature about mandatory vaccination policies to inform our assessment, from psychology and behavioural science to ethics, political theory, sociology, and public policy.

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1. Introduction

Protests against COVID-19 health measures (also termed ‘anti-lockdown’ protests) beginning in June of 2020, notably in the US and Europe (including the UK) [10,25]¹ brought together two constituencies: pre-existing vaccine critical ‘anti-vaccine’ groups and newly formed oppositional groups to COVID-19 health measures. Sometimes going against government advice and marred by violence, the protests provided a public display of deep dissatisfaction but have rarely been about one topic alone. The result has been a new configuration of public attitudes and beliefs about health, which has been pitted against public health goals and messaging. Both masks and vaccines come from a backdrop of public resistance – although the opposition to vaccines has been a more enduring social

trend – mostly because vaccination forms such a large part of public health and the existence of a variety of vaccine mandates across countries [1,42]. The need for mask-wearing on the other hand has been mostly restricted to healthcare workers in their occupational setting. Aside from facemasks being more habitual and accepted in some countries (such as Japan and Taiwan: see [3,4], which we will not address specifically in this paper), they have also played an important role to limit the spread of infection during outbreaks and pandemics.

While opposition to vaccines – especially the formation of organised groups – was an earlier response to public health mandates, opposition to masks similarly came in a reaction to mandates, but these occasions have been limited to outbreak and pandemic contexts. For example, during the Spanish flu pandemic (1918–1920), opposition occurred in San Francisco in 1919 when the authorities attempted to put in place a mandate for mask-wearing in public places, which prompted the formation of the Anti-Mask League (Dolan, 2020). However, this protest movement was only limited to this specific event. Incidentally, the roots for

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pro-mask-wearing behaviours in Japan can also be traced back to the Spanish flu pandemic, although Burgess & Horii [3] argue that the practice only became socially embedded in the 1990s through “commercial, corporate and political pressures that responsabilised individual health protection” (p. 1184). In comparison, early ‘Anti-Vaccination Leagues’ against mandatory smallpox vaccination that began in the 19th Century in Europe and US, have evolved into organised and long-standing anti-vaccine groups today [43,37]. Small but vocal, these (sometimes very loose organisations) are especially active on online media and social media [11]. A new development has been how well-established public vaccine opposition has mobilised against masks and the connections that have forged between opposing both vaccines and masks.

To inform our assessment of this convergence between interests of groups of publics on health issues, we draw on previous literature about mandatory vaccination policies, from psychology and behavioural science to ethics, political theory, sociology, and public policy. Very recently a literature on attitudes to mask-wearing has developed through psychologists, interested in knowing the factors that drive use [5,21], including by demographic group (men vs women) [33,19], as well as political scientists and public health researchers focused on mask messaging [41] and culture change [26]. Through this paper we aim at understanding how social media discussions and debates about mandates from mask-wearing to vaccination were connected through their opposition to COVID-19 public health policies and have evolved over the course of the pandemic.

What we uncover is a complex topic of public attitudes and beliefs in reaction to public health goals and messaging. Particular attention was paid to connections in conversations between key issues of concern regarding masks and vaccines across social media networks. To analyse dominant topics of discussion, we concentrated on stance and associated language used on Twitter about public health activities to control outbreaks. We used media monitoring software Meltwater™ for one year to track social media conversations and make an assessment of key trends and themes of discussion concerning attitudes to and adoption of these health measures to control COVID-19 and track the public reaction when confronted with mandatory policies.

2. Materials and methods

Social media data was collected from Twitter using media monitoring software Meltwater™ [27]. Tweets were collected where there were mentions of supportive or oppositional mask and COVID-19 vaccines, between June 2020 and June 2021. We chose to limit our geographic scope to the UK and US as countries where high profile protests had occurred and where political events were strongly intertwined with government and public responses during the pandemic. An initial general Boolean search (Appendix a.) was conducted to get a broad overview of the main pro and anti-mask and COVID-19 vaccine topics. “Pro” in this context means an overall positive attitude towards the wearing of masks and the protection offered by vaccines within the context of the COVID-19 pandemic. “Anti” in this context means an overall negative attitude towards the wearing of masks and vaccines within the context of the COVID-19 pandemic. Clearly the distinction between pro and anti is more nuanced than this binary. However, we found that in the context of protest and public dissatisfaction it was necessary to seek extreme views in order to understand the discourse.

A total of 7.89 million (abbreviated to ‘m’ from here on) tweets were collected and analysed from Twitter for a broad overview of themes and co-related hashtags occurring over the period between June 2020–2021. We focused on Twitter as a social media platform because it produced the most data that was time-linked, to view responses to events over the course of the year, and also acted as

a signpost to relevant content on other social media platforms. Once an overview of the data was established, we conducted a second more focused Boolean search (Appendix b), which included keywords and hashtags found in the initial data sample, where usage referred to people’s opinions and experiences of masks and vaccines.

We then conducted a discourse analysis using text network analysis software Infranodus [34] to measure themes and patterns occurring in discussions around masks and vaccines, as well as the betweenness centrality of subtopics – an analysis of connections between subtopics that link different types of conversation clusters together to identify, including similarities in behaviour. We imported data into Infranodus to highlight key word clusters, and thus influential topics used in discussions on social media. Semantic networks were generated by organising the data by specific topic (masks and vaccines) and analysed each topic separately to find specific subthemes within each one. Word clusters derived from analysis using modularity class were used to highlight the most common topics of conversation within a cluster of tweets. Keywords derived from analysis using betweenness centrality were used to give a more in-depth understanding of influential words that link different clusters of conversations together. Word frequency analysis was then performed on the dataset to provide insight into the most frequent and weighted subtopics of conversation. This provided a more detailed content review of topics generated by Infranodus [24].

We explored discussions of anti-mask views that also mention vaccines, where mentions of vaccines also occurred in conversations regarding confusion about government mask policy. Once the key themes were identified, individual tweets were selected for textual analysis in order to draw out specific issues for a more qualitative interrogation of topics of concern at hand. Our approach to analysis draws on Lewis et al. [18] where empirical materials are treated not only as data that is freestanding but also as an ‘empirical trigger’ to describe and analyse research topics. We employed a constructivist grounded theory [6,38] for our interpretation of the empirical material, following the principles of an iterative and reflexive process.

In using market analytical software (such as Meltwater) to assess sentiment we are aware of the difficulty of accurately classifying sentiment or stance of a tweet or post within the correct context or perspective of the study subject being researched [43]. Thus, drawing on previous research [17,24], we aimed to get a better understanding of sentiment by creating a ‘manual sentiment framework’. To break out of the grip of marketing bias within the commercial software, this framework used definitions based on our analysis to ‘re-annotate’ a smaller subsample of tweets, and applied a more specific qualitative lens. Under the framework, sentiment was measured in terms of differences in attitudes towards masks and vaccines within the context of the pandemic (Appendix c, d). Tweets were classified as positive towards masks or vaccines if, for example, they were affirming of masks or vaccines or communicated overall trust of masks or vaccines. Tweets were marked as negative if they contained negative attitudes or arguments against masks or vaccines, shared bad experiences or discouraged the following of public health guidelines. Tweets were then marked as neutral if they contained only a general statement, with no expression of sentiment or opinion.

3. Results

Between June 2020 and June 2021, we used Meltwater™ to perform a global search of Twitter, and we found that across a sample of the UK and US, there were 7.89 million English language tweets mentioned both pro and anti opinions regarding the wearing of

masks and COVID-19 vaccines. The most messages about masks and vaccines were from the US (6.98 m), followed by the UK (915 k (Fig. 1). Analysis showed that overall, discussions about masks were most dominant between June 2020 and June 2021, with 5.91 m specific mentions of masks, and 1.98 m specific mentions of the COVID-19 vaccine (Fig. 2). The dominance of discourse around masks may have occurred due to events during the most of the first year of the pandemic, where masks were seen as the main source of protection against COVID-19, and were mandated as necessary in some countries, while work on an effective COVID-19 vaccine was underway [30].

Key points of discussion with regards to masks and vaccines were between 25th June – 19th July 2020, 12th August to 17th September 2020, 1st October – 25th November, and then January and March 2021. Between 25th June – 19th July 2020, a total of 810 k tweets in the UK and the US discussed mask mandates, and a series of anti-mask protests and anti-lockdown protests held both in the UK and the US. From 12th August – 17th September, the main debate occurring on Twitter centered around political discussion with official tweets on 16th August by both US President Joe Biden, and Vice President Kamala Harris calling for a federal mask mandate to be issued nationwide across the US, as well as an acceleration of the development of treatments and vaccines. Between 1st October and 25th November 2020, debate across social media platforms also focused on masks and vaccines most specifically in response to tweets by President Joe Biden about mask mandates and vaccines, as well as discourse in the US about the need to socially distance and wear masks around the US national Thanksgiving holiday (26th November 2020). Discussions around masks also spiked around 21st January 2021, in response to a tweet by President Joe Biden, who declared that wearing masks

was a patriotic act, and not a partisan issue, and that he had signed an executive order issuing a mask mandate after months of cross-party debate. On 2nd March 2021, the spike in discourse centered around a tweet by a Texas Governor with regards to him ending the mask mandate across the state of Texas as a direct rebuke of President Joe Biden's executive order – debate around this topic was both positive and negative amongst both anti and pro-mask supporters. The content and discourse analysis of all of these topics is further discussed in the next sections about the support and opposition towards masks and vaccines.

In the UK, the discussion points also involved mask mandates but included a wider commentary about the wearing of masks by high profile figures and government policy around both masks and vaccines. One of the most critically engaged with tweet in the UK was by television presenter Piers Morgan on 10th July 2020, where he criticised the London Mayor, Sadiq Khan for not wearing a mask while doing an interview focused on mask mandates. In the Interview, Khan said that he found it astounding that people found it a sign of strength to see conservative leaders such as Prime Minister Boris Johnson and former President Donald Trump did not wear masks. The discussion around Piers Morgan criticising the Mayor for not wearing a mask, while he admonished other leaders, drew more engagement than the Mayor's actual post, with 11.8 k likes and shares criticising Khan, with a reach of 7.63 m, compared to the 521 retweets and shares of the original tweet. Between July 15th – 27th 2020, there was also further critique of mixed messaging from the UK government, with regards to when and where people were required to wear masks when shopping or eating food in cafes and restaurants, most specifically in relation to the £100 GBP fine, that police were allowed to issue. Between 14th February and 6th April 2021, the topic of vaccine

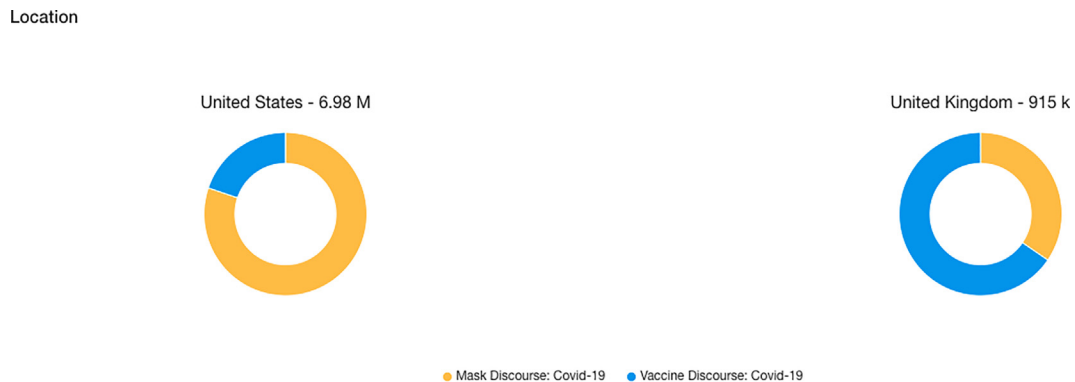


Fig. 1. Overall discourse activity regarding Masks and Vaccines (June 2020–2021).

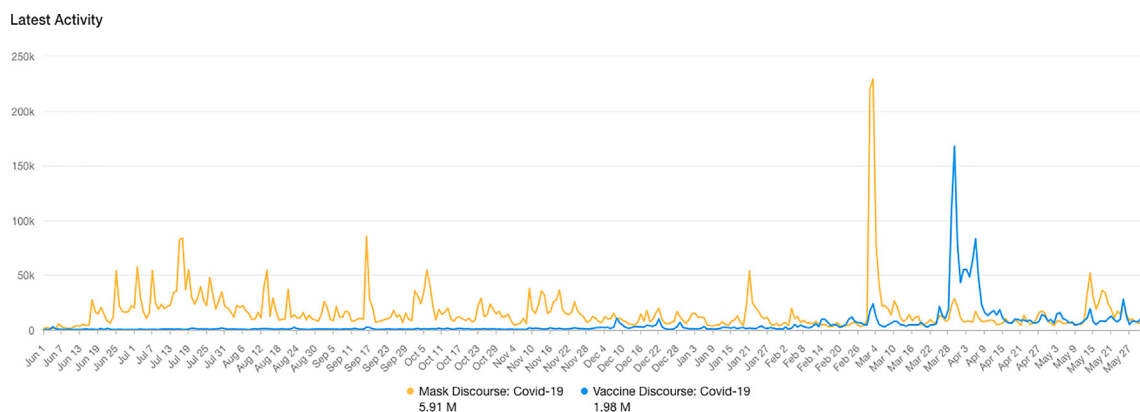


Fig. 2. Compared rates of discourse activity regarding Masks and Vaccines (June 2020–2021).

passports was prominent in the UK, with a high volume of debate around the use of them for both travel and large events, overall, a favourable discussion centered around travel, whereas there was more mixed debate with regards to access to night clubs and larger venues. Between 22nd February and 23rd March, discussion in the UK about vaccines, centered around both access through a staggered rollout via priority group, as well as discussion about the effectiveness of vaccines, and their ability to prevent serious illness or death. There were also questions about the vaccine safety, vaccine hesitancy amongst younger people and black and minority ethnic groups, as well as questions about whether it was safe for younger children to get the vaccine. Discussions around masks in the UK also peaked between 3rd – 14th March 2021, when parents opposed to a mask mandate for children returning to school tweeted their opposition to schools imposing mask guidelines and pushed back at government responses.

Discourse regarding vaccines in both the UK and US can be seen to have started to rise between 4th – 10th December 2020, as different vaccines were certified for public use, and public health programmes got underway. From 14th February to 25th March 2021, there was increased discussion in both countries about the efficacy, safety and supply of different vaccines, as public health programmes rolled out vaccines. However, big peaks occurred between 25th March – 1st April and 2nd – 8th April, where there was increased discussion about the prospect of vaccine passports being made mandatory for global travel and large events ([8,32]). Overall, social media sentiment in terms of anti-mask and anti-vaccine attitudes across both countries was similar, with the UK being slightly more negative towards masks (28% compared to the US at 22% negative), and both having similar rates of negative sentiment towards vaccines with the US at 17% and the UK at 15% (Fig. 3, and Appendix b).

4. Discourse analysis

Through a discourse analysis of the conversations about masks and vaccines, we can organise the social network discussions across four themes. Subthemes that ran throughout these were about social norms, beliefs, and discomfort or inconvenience. The four key themes of discussion were:

1. Support of masks and vaccines (Pro);
2. Opposition to mask and vaccines (Anti);
3. Conspiracy theories;
4. Public health messaging and scientific uncertainty. We discuss these themes next.

(1) Support of masks and vaccines (Pro)

In identifying reasons in the anti-mask discourse, we found that one of the main topics of conversation was around mask mandates and mixed government messaging about the effectiveness of

masks. In the pro-mask discourse (Fig. 4), while people supported the wearing of masks as protection against COVID-19, there was also confusion about mixed, changeable and unclear public health messaging – especially the official advice regarding what types of masks were appropriate to wear and when [15]. Early on in the pandemic, the World Health Organization (WHO) had recommended that masks not be worn at all by the public, as they did not see their effectiveness for general use and wanted to reserve masks for healthcare workers and people known to be infected with COVID-19, but as evidence mounted, they were forced to reverse their position [9]. The messaging then evolved to encourage and mandate mask use in public places. The social media conversations in response largely related to school and business contexts (including wearing masks in lifts), and the differing mandates across geographical areas (in state jurisdictions for the US and in the different nations of the UK), as well as rationale for central government advice and decisions (e.g. the Centers for Disease Control and Prevention – CDC – lifting of the mask mandate for vaccinated individuals) (see Fig. 5).

The reasons for supporting the wearing of masks were broadly split with those who referred to a “mask vaccine” emphasised in the first six months (June – Dec 2021) – that using a mask had a similar effect to being vaccinated and should be used as much as possible before vaccines were widely available. Others viewed the good behaviour of wearing a mask as needing to be rewarded and deemed that those who did not wear masks, should be punished by not being allowed to get a vaccine, see box below.

Box 1 Pro-mask tweet.

Pro-mask support: Calls for people anti-mask wearers to be punished by not getting vaccine

“No Covid denying politician should get a vaccine before every Dr, nurse, hospital worker, EMT, cop, fire fighter, teacher, supermarket worker, pharmacy worker, food-chain worker, book store worker who has to deal with abusive no mask a-holes & many others @user

“Young, healthy Senator, who spoke at rallies packed w/ thousands w/o masks, who supports Trump -who’s downplayed COVID & mocked those who wear masks, is 1st to get vaccine while most medical workers, elderly & infirm Americans, wait. Congratulations on ur privilege, @user”.

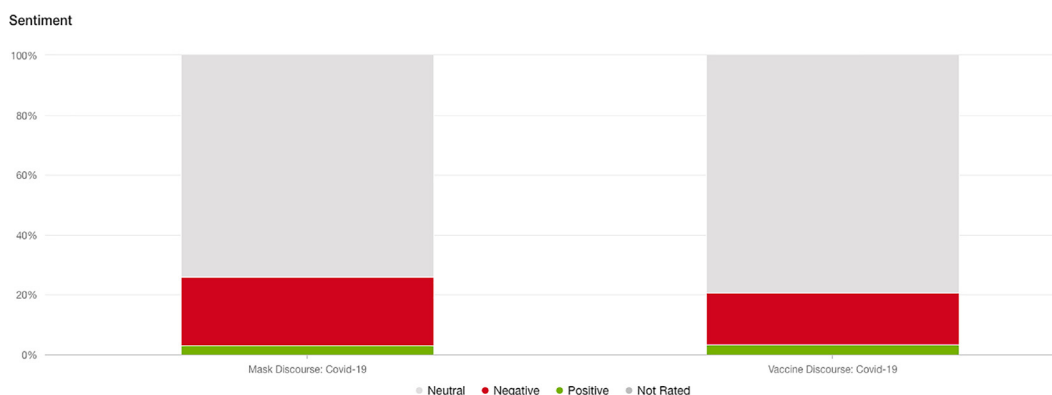


Fig. 3. Compared rates of sentiment regarding Masks and Vaccines (June 2020–2021).

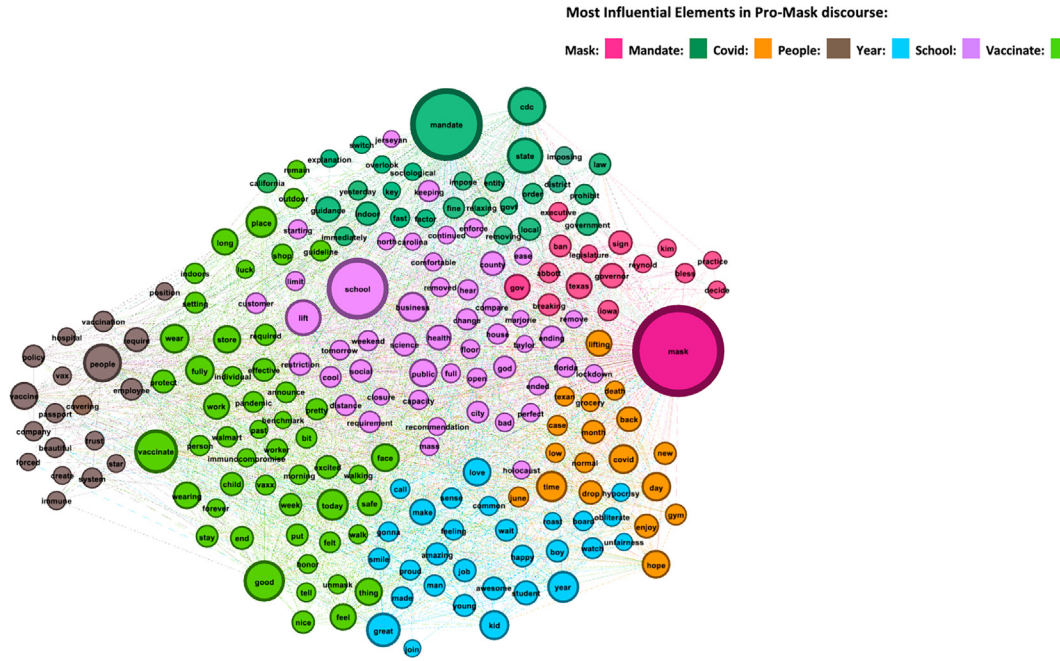


Fig. 4. All Pro-mask discourse: Most influential topics (June 2020–2021).

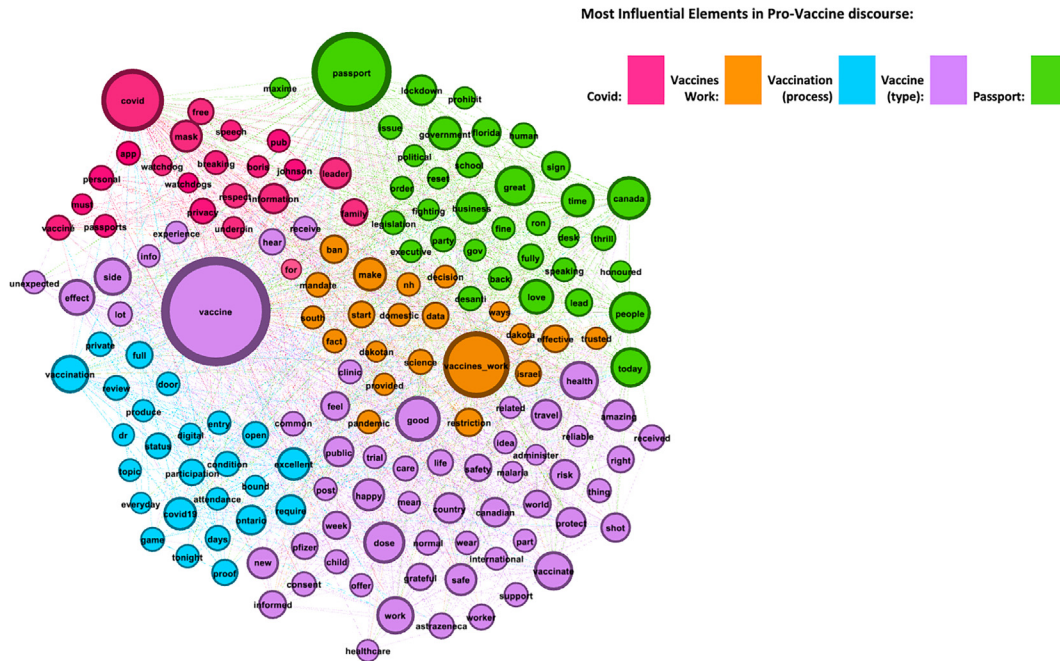


Fig. 5. All Pro-vaccine discourse: Most influential topics (June 2020–2021).

While the wearing of masks in schools was also discussed in both the UK and US, many saw mask wearing as a good option for preventing the spread of the virus from schools and out into the wider community as lockdown was lifted and children also accompanied adults to shops and other businesses. Discussion of the comfort or discomfort that children experienced while wearing masks was present, while others also worried that authorities were not taking mask wearing seriously enough, especially when children were not able to be vaccinated, and were deemed to have less protection (despite official status quo that children were less likely

to be badly affected by COVID-19). There was also discussion of anti-mask aggression, where anti-maskers in Europe were reported as ripping off the masks of those policing the protests [14].

With regards to COVID-19 vaccines, masks remained a key theme in discussion, with people discussing anti-mask protests, also including anti-vaccine protests and the danger of going unmasked in large crowds and on public transport, before a high proportion of the public were vaccinated. Most of the discussion

Box 2 Mask opposition tweet.

Dislike experience of wearing mask

"#MaskVaccine! Face diapers are gross - it was always obvious they collect (and spread) pathogens. Interestingly, where are all the allegedly blocked Covid droplets ☐?"

(3) Conspiracy theories

The strongest opposition to masks was linked to conspiracy theories, with beliefs that the COVID-19 pandemic was a hoax (#pandemic), that COVID-19 was not a big health threat, and no worse than contracting mild flu, and that it was better to catch COVID-19 and build up a natural immunity, which wearing a mask was thought to impede. Anti-maskers also shared views that people who wore masks without question were blind followers of government control and regulations.

Box 3 Conspiracy theory tweet.

Anti-mask tweet referencing conspiracy theories:

"#MaskVaccine! #MaskCovidians #MasksDontWork #MasksHaveConsequences #MasksOff

Quote Tweet:

· Mar 27

What's great about masks is that they never have to actually work. Like the Czech Republic, which @DrX said "conquered" Covid with masks, seeing results dramatically worse than countries with much, much lower mask usage.

But none of that matters! Cause experts."

Mask wearers were accused of acting like sheep who were being directed down a hopeless path and protecting against a survivable virus – using the nickname and hashtag #Sheeple to describe them. The hashtags #Wakeup and #Fightback were also used in relation to discourse around this topic, with masks argued to be a symbol of showing how 'scared', 'compliant' people were, as opposed to what was seen as fake liberal propaganda messaging that mask wearing was 'brave' or 'caring'.

Steyer [39] has highlighted the strong symbolic nature of mask-wearing and Martinelli et al. [22] have argued that a multitude of meanings are conveyed – sociocultural, ethical, and political.

Box 4 Symbolism tweet.

Symbolism Tweet from Anti-masker, conveying that belief in effectiveness of masks is "tribalism":

"#MaskVaccine !

QT: Tribalism > science:

"I'm going to wear a mask for a long time to come," said XX, X, who was grocery shopping in San Antonio on Friday morning while wearing a black cloth mask. "I trust the mask more than the vaccine."

It was also argued that mask wearing could have psychological impacts or claustrophobia, raised anxiety and other related issues [13]. This view was also linked with suspicion about perceived government control around vaccines, and speculation that a compulsory vaccine mandate would be imposed on people at the expense of choice and liberty. Surveys in US told a similar story and equated the "aversion to being forced to wear masks" as "psychological resistance" [40].

(4) Public health messaging and scientific uncertainty

In the US in particular, the anti-mask and anti-vaccine discourse was discussed along party political lines, as we have outlined in the peaks of discourse. Some Republican and Trump supporters argued that any mask mandates were Democrat attempts to curb their political and human rights freedoms to choose to not wear a mask. Such views have been reflected in public opinion polls [36], suggesting that people with conservative political affiliations (such as Republicans) are less likely to wear masks compared with people who have liberal affiliations (Democrats). Understanding the reasons for this difference may not be so straightforward. On the one hand, as people may have been following the example of Republican political leaders who were initially reluctant to wear masks, and some went further to mock those who wore masks. On the other hand, more generally, people with politically conservative ideologies have tended to resist government regulatory efforts, 'intrusion' into the personal sphere, and 'big government'.

Box 5 Public health tweet.

Anti-mask tweets example, linked to mask mandates and politics:

“QT @thehill: Trump could fart and the dems would scream Nazi so forgive me if I dont give a shit; Greene has sparked new backlash in recent days over comments she made equating mask mandates to the treatment of Jews during the Holocaust.”

In cases, in both the UK and US, the hashtags #MaskRevolt and #MillionUnmaskedMarch were used by political groups to organise and share the location of anti-mask and anti-lockdown protests, while in the US, the specific hashtag #MillionUnmaskedPatriots was used in association with protests to mask mandates in Idaho and Texas, as well as states and regions where governors had imposed mask mandates. Other co-related anti-mask hashtags used included #masktyranny, #Covid-1984, #COVID1984, #constitutionovercoronavirus, #Covid-mask-vaccine, #nomask, #masksoff, #masksoffamerica, #MasksoffUK, #maskvaccine, #plandemic, #scamdemic, #notmynewnormal, #masksdontwork, and #no-mask_campaign. Therefore, the symbolic and very visible nature of mask-wearing and parallels made with mouth-gags and the suppression of speech, was used to organise protests against COVID-19 health measures.

Box 6 Public health tweet.

Public Health messaging: Tweet example of mixed government guidance re. Masks:

“QT:“Fauci has been trustworthy for the whole pandemic, explaining distinctions between developing theories & verified data, making it easier to understand & trust when recommended practices evolved. Good reminder that for public policy and public health, you have to get the social science right and not just the science; The CDC mask guidance switched too fast without enough explanation and overlooks key sociological factors for indoor mask mandates—especially to protect workers and the immunocompromised. Better to have announced benchmarks—and kept it up just a bit more.”; The CDC mask guidance switched too fast without enough explanation and overlooks key sociological factors for indoor mask mandates—especially to protect workers and the immunocompromised. Better to have announced benchmarks—and kept it up just a bit more.”

Scientific uncertainty was also a theme running through both anti-mask (Fig. 6) and anti-vaccine discourse (Fig. 7). While emerging science about the effectiveness of mask-wearing in preventing the spread of COVID-19 has been supportive overall and the evidence is growing that masks limit the spread of infection [35], it has been complicated to be definitive about how well masks work or when to use them. The sharing of emerging research studies and the impact of academic preprints on global discourse in both the media and online – as people tried to make sense of the COVID-19 pandemic – also led to considerable debate and worry about the reliance of policymakers on scientific research that has not had time to be peer reviewed [20,23]. Partly due to this kind of uncertainty, and the differing views in emerging literature, we found a number of anti-mask posts sharing examples on Twitter and links to TikTok (see Box 6) of assumed scientific evidence questioning the effectiveness of masks, and in some cases amplifying the discussion of known risks of mask-wearing to certain groups with breathing difficulties (e.g. severe Cryptogenic Organising Pneumonia or asthma) as evidence that mask-wearing was not merely ineffective but actually dangerous. These findings match surveys conducted in the US, that a key reason for not wearing a mask was the view of them not being effective in preventing COVID-19 [40]. Early in the pandemic, surveys cited reasons for not wearing a facemask in the UK being because they did not feel they needed to if they avoided riskier situations and a sizeable proportion (22%) stated it was because masks are not mandatory.

Vaccine opposition discourse centered around mistrust of the speed and process of creating COVID-19 vaccines, mistrust of the contents and micro-constituents of vaccine ingredients, including conspiracy theories about whether COVID-19 vaccines contained pork, aluminum, DNA-altering properties (mRNA vaccines such as Pfizer and Moderna). Some also implied that governments had bad intentions to use COVID-19 to control citizens: ‘Bill Gates’ vaccine or COVID-1984 ‘COVID-1984 vaccine’ with a microchip - hashtags such as #covid1984, #Covid-1984 and #VaccineChip were also used with these messages. Such discourse often also contained vaccine misinformation regarding vaccine side effects or vaccine harm, such as reduced fertility, chronic illnesses or birth defects or harm to unborn children.

Many of these tweets also utilised pre-COVID-19 hashtags [31], such as #LearnTheRisk #VaccineKill, #BodilyAutonomy and #InformedConsent. These hashtags have previously been linked to more general campaigns against influenza, measles, and pertussis vaccination by large and organised anti-vaccine groups. They were found here to be used with similar sociolinguistic variations, focusing on perceived vaccine hesitancy and anxieties around the safety of new COVID-19 vaccines and using messages with hashtags like #InformedConsent and “#learntherisk”, which appear to communicate concerns about the safety of the vaccines and the need for choice, however are also used with text sharing vaccine misinformation and conspiracy theories about the contents and effects of the COVID-19 vaccine [28].

5. Conclusion

The discourse about masks and vaccines in both the UK and US, followed similar themes, which could be attributed to how the flow public dialogue between the two countries (particularly the US to UK) and their similar public health programmes in terms of introducing mask mandates, vaccinating the populations over the months; facing similar public debates about COVID-19 health policies and measures involving masks and vaccines.

Through our analysis we were able to identify reasons for opposition of facemasks and vaccines during the COVID-19 pandemic. The main reasons given for support of masks and vaccines (Pro) were protection against contracting COVID-19 and stopping the spread of the virus. The discomfort or inconvenience was discussed even by those who were not completely opposed to mask-wearing. The main reasons in opposition to masks and vaccines (Anti) were, impositions on freedom, independence and body autonomy, beliefs in conspiracy theories, and worry about side effects of vaccines. Opposition to both masks and vaccines were connected to conspiracy theories. Furthermore, public health messaging and the UK and US government advice were referred to by both pro and anti-groups, using different sentiments. The public health messaging and government advice was set against a backdrop of confusion especially with the official advice [15]. Mheidly, and Fares [29] argue that the confused messaging has not only by government, but across different levels public health communication – from how the media shares scientific information to the overuse of pre-prints as fact, and this then fuels misinformation. Lastly, scientific uncertainty featured and to try to address what was unknown, emerging research studies were shared and explored (often in specific contexts) how effective mask-wearing is.

The subthemes that ran throughout were about discomfort or inconvenience (including issues of communication and problems for those with medical conditions or disabilities), and beliefs and social norms. The discomfort and inconvenience of wearing facemasks here referred to a dislike of the experience and feeling of wearing a mask. Other points raised were that it caused problems with communicating (e.g. surveys about adherence to public health measures) and medical conditions or disabilities that made mask wearing difficult. Masks are also symbolic of underlying beliefs in their value – being 'scared', 'compliant' or 'brave', 'caring' and so make a statement. Beliefs that have run through include, COVID-19 not being a big health threat and political beliefs, where being anti-mask is aligned with libertarian views. This also spills over into conspiracy theories about mask-wearing for government control. We have also outlined how social norms are being reconfigured, with limited previous experience with mask wearing. What has emerged is a conflict in values on individual liberty vs collective culture – especially for mandatory health measures. The learnings from social media analysis of the connection between anti-mask and anti-vaccine views are that while some discussions and subthemes overlap, there is also a connection back to pre-COVID-19 terminologies and hashtags (e.g. #learntherisk and #informedconsent) from previous anti-vaccine campaigns. Future analysis of these connections in terms of both patterns of discourse and group organisational psychology may be of benefit to establishing a more robust public health communications campaign to enable stronger future vaccine uptake.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Boolean search terms:

1. General scoping boolean search for Pro + Anti Mask and Vaccine content (June 2020 - June 2021)

((“mask”) AND (“vaccin” OR “vax” OR “jab”))

2. Focused boolean (including co-related hashtags and anti-pro mask/vaccine wordings - June 2020 - June 2021)

((“mask” OR “vaccine”) AND (“informedconsent” OR “informed consent” OR “vaccinefreedom” OR “vaccine freedom” OR “bodilyautonomy” OR “bodily autonomy” OR “medicalfreedom” OR “medical freedom” OR “covid-1984” OR “covid1984” OR “covid 1984” OR “constitutionovercoronavirus” OR “constitution over coronavirus” OR “covid-mask-vaccine” OR “covid mask vaccine” OR “maskvaccine” OR “mask vaccine” OR “nomask” OR “no mask” OR “idonotconsent” OR “i do not consent” OR “masksoff” OR “masks off” OR “masksoffamerica” OR “masks off america” OR “masksoffuk” OR “masks off uk” OR “plandemic” OR “scandemic” OR “notmynewnormal” OR “not my new normal” OR “sheep” OR “1984vaccine” OR “1984 vaccine” OR “vaccinechip” OR “vaccine chip” OR “learntherisk” OR “learn the risk” OR “maskrevolt” OR “mask revolt” OR “mask mandate” OR “maskmandate” OR “compulsorymask” OR “compulsory mask” OR “vaccinepassport” OR “vaccine passport” OR “vaccinesideeffect” OR “vaccine side effect” OR “vaccineswork” OR “vaccines work” OR “masktyranny” OR “mask tyranny” OR “vaccineskilllives” OR “vaccines kill lives” OR “mandatemasksnow” OR “mandate masks now” OR “million unmasked patriots” OR “million unmasked march” OR “millionunmaskedpatriots” OR “millionunmaskedmarch” OR “no mask campaign” OR “nomaskcampaign”))

3. Sentiment analysis of attitudes towards masks

Positive (P)

- Post communicating overall trust and satisfaction with public health guidelines and support for mask wearing in the context of the COVID-19 pandemic.
- Posts are affirming of mask wearing to protect against COVID-19 and experiences of wearing masks.
- Post describes the importance of mask wearing within the COVID-19 context.

Negative (N)

- Post contains negative attitude/arguments against public health guidelines and support for mask wearing in the context of the COVID-19 pandemic.
- Post discourages the following of recommended guidelines/support related to wearing masks (for personal, political or conspiracy theory reasons).

- Post shares bad experiences of wearing masks, and discourages others from wearing masks.

Neutral (NT)

- Post contains no elements of uncertainty, positive or negative content.
- Post contains general statement(s) or link(s) to item(s) (e.g. news articles/papers) with no expression of sentiment.
- Post includes factual statements/recommendations about mask wearing in the context of the COVID-19 pandemic, but no sentiment.

4. Sentiment analysis of attitudes towards COVID-19 vaccine(s)

Positive (P)

- Post communicating overall trust and satisfaction with public health guidelines and support for COVID-19 vaccine(s).
- Posts are affirming of getting COVID-19 vaccine(s) to protect against COVID-19.
- Post describes the importance of COVID-19 vaccine(s).

Negative (N)

- Post contains negative attitudes/arguments against public health guidelines and support for COVID-19 vaccine(s).
- Post discourages the following of recommended guidelines/support related to COVID-19 vaccine(s) - (for personal, political or conspiracy theory reasons).
- Post shares bad experiences of COVID-19 vaccine(s), and discourages others from getting COVID-19 vaccine(s).

Neutral (NT)

- Post contains no elements of uncertainty, positive or negative content.
- Post contains general statement(s) or link(s) to item(s) (e.g. news articles/papers) with no expression of sentiment.
- Post includes factual statements/recommendations related to COVID-19 vaccine(s), but no sentiment.

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