Black Lives Matter and Its Counter-Movements on Facebook

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Abstract

Racial inequality and discrimination are some of the most pressing social issues (Chetty et al., 2020; Goncalves & Mello, 2021). Yet, despite the increasing awareness of racial disparities and the need for social change (Horowitz et al., 2019), movements opposing racial justice are on the rise (Daniels, 2017; Phadke & Mitra, 2020). However, there has been a lack of large-scale, systematic analysis of discussions about racial movements on the world's largest social media, Facebook. Here, we study the evolution of Black Lives Matter (BLM) and its counter-movements on Facebook from their inception to the present. In particular, we examine the information ecosystem that enables the production and dissemination of their narratives based on the largest Facebook dataset that has been ever reported on these movements. We find that, since the early days of BLM, counter-movement groups have maintained a consistent and significant presence on the platform and are continuing to grow. Importantly, although Facebook pages and groups supporting BLM have been dominant in terms of the number of groups and the volume of content produced, counter-movement groups have attracted far more attention than BLM groups in terms of content engagements, such as shares, comments, and reactions. We also found that counter-movement groups relied more significantly on low credibility sites, as well as conservative and far-right news sources. The findings provide evidence of the long-term evolution of online groups opposing racial justice on the social media platform and the infiltration of biased and misleading information through the fragmented and polarized patterns of connections within the digital platform.

Keywords: Social media, social movement, online community, social network, misinformation

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In the summer of 2020, the protests against the police killing of George Floyd brought renewed attention to the Black Lives Matter movement and issues of racial inequality in the United States and globally. Since the inception of the movement's slogan on social media in 2013, Black Lives Matter has continued to grow and highlight racial inequality and discrimination as some of the most pressing social issues of our time (Chetty et al., 2020; Goncalves & Mello, 2021). Yet, despite the increasing awareness of racial disparities and the need for social change (Horowitz et al., 2019), movements opposing racial justice are also on the rise (Daniels, 2017; Phadke & Mitra, 2020).

Social media play a vital role in influencing people's opinion formation, spreading information, and mobilizing support around racial equality and justice issues (Freelon, Bossetta, et al., 2020; Ince et al., 2017; Jackson & Foucault Welles, 2016). At the same time, there have been escalating concerns that social media tools are also deployed to circulate misinformation and propaganda, and mobilize extremist and far-right groups (Freelon, Marwick, et al., 2020; Marwick & Lewis, 2017; Munn, 2021; Vosoughi et al., 2018). Scholars have further noted asymmetries in information behaviors of left-leaning and right-leaning activists and movements (Freelon, Marwick, et al., 2020). Emerging studies show how some social media platforms have aided the mobilization of extremist and far-right groups, such as the groups that have stormed the US Capitol in January 2021 (Munn, 2021). Notwithstanding these concerns, there has been a lack of large-scale, systematic analysis of the evolution and dynamics of movements for and against social justice on the world's largest social media, Facebook, in part due to a lack of access to proprietary data and methodological challenges (Ghaffary, 2021).

Here, we present an analysis of 2,156 online groups that supported BLM or its counter-movements—All Lives Matter, Blue Lives Matter, White Lives Matter, and anti-BLM— on Facebook between 2013 and 2020. During this period, these groups generated over 362,000 posts that attracted over 200 million shares, comments, and reactions. Their messages were delivered to their followers on Facebook over 20 billion times since 2018. We investigate the prevalence of online groups supporting BLM or its counter-movements and the information ecosystem that these groups relied on to support their views. This research focused on three critical but largely unanswered questions: How pervasive is the support for BLM or its counter-movements on Facebook? How much user engagement did content produced by BLM and its counter-movement groups generate on the platform? How much did these groups rely on information from low credibility sources and politically biased sources?

We expand the existing literature by exploring the broader information ecosystem within which the four interrelated movements—Black Lives Matter, All Lives Matter, Blue Lives Matter, and White Lives Matter—produce and circulate their competing narratives about race, racial injustice, and inequality. Social media platforms have been key sites of racial and cultural identity formation and performance (Brock, 2012; Florini, 2014). Citizens and activists often turn to social media to document and expose racial injustice, challenge negative cultural stereotypes, and circulate counternarratives (Everbach et al., 2018; Florini, 2019; Richardson, 2017). Scholars have shown how social media sites have been instrumental to Black and other racialized communities in shaping and mainstreaming issues of race and racial inequality into national and international conversations (Brock, 2012; Florini, 2014, 2019; Richardson, 2017).

However, malicious actors also use social media to spread antagonistic narratives and disinformation targeting Black communities. They mobilize movements against racial justice,

manipulate online discourse, and sow social division. Recent studies show how online narratives may be co-opted, hijacked, or disrupted by actors and algorithms on social media platforms (Arif et al., 2018; Freelon, Bossetta, et al., 2020; Howard et al., 2019; Jackson & Foucault Welles, 2015). Social media algorithms can also fuel and accelerate the circulation and amplification of racist, xenophobic, hateful messages (Daniels, 2018; Hagey & Horwitz, 2021; Munn, 2021; Rathje et al., 2021). Furthermore, there are escalating concerns that the design, affordances, business models, and policies amplify racist discourses (Matamoros-Fernández, 2017; Noble, 2018).

The present study aims to overcome three critical shortcomings of past research on social media discourse on race and racial justice. First, while previous work has largely focused on Twitter, evidence is still thin about other platforms, especially Facebook, the world's largest social media site with nearly 3 billion users. Recent events suggest that Facebook is hosting widespread hateful and misleading content on its platform, while its policies and algorithms amplify it (Hagey & Horwitz, 2021; Rathje et al., 2021). Second, there is a lack of knowledge about how Black Lives Matter and counter-movements have interacted with the broader information ecosystem within and outside social media platforms, such as news media outlets and misinformation sources. Lastly, although it has been reported that those who stand against racial justice movements have galvanized social media platforms to disseminate their hateful arguments and grow their supporter base (Roose, 2020), past studies have predominantly focused only on online users supporting racial justice groups and movements.

Hence, this study examines the co-evolution of these competing movements within the broad information ecosystem, based on the most extensive Facebook dataset that has ever been reported on this issue. A large-scale, systematic analysis reported in this study may offer more

reliable and generalizable observations and inferences on the prevalence, characteristics, and ecology of these movements in digital spaces.

Methods

We collected a dataset of online groups discussing Black Lives Matter and its counter-movements on Facebook. Multiple human coders reviewed the content of each Facebook page and group in detail, evaluated its orientation, and classified it into Black Lives Matter (BLM), counter-movements (CNT), and mixed views (Mixed) groups. CNT groups were further categorized into White Lives Matter (WLM), Blue Lives Matter (Blue LM), All Lives Matter (ALM), and Anti-BLM groups. Anti-BLM groups include groups that are critical of Black Lives Matter without explicitly supporting a particular countermovement. This study was approved by the Institutional Review Board of [removed for the blind review process].

In this study, a "BLM" group, a "CNT" group, a "WLM"/"BlueLM"/"ALM"/"anti-BLM" group, and a "Mixed" group refer to a community of Facebook users who managed, created content for, and interacted with a Facebook page or group with a specific orientation. When indicating physical webpages within the Facebook website, we state "a Facebook page," "a Facebook group," "a Facebook page or group," or "Facebook pages and groups," without omitting "Facebook" from these terms.

Data Collection

We used CrowdTangle to identify online groups on Facebook and collect their content data. CrowdTangle is "a public insights tool owned and operated by Facebook," and it allows researchers to search and download Facebook data. CrowdTangle tracks public Facebook pages, groups, and individual profiles (CrowdTangle Team, 2021a, 2021b). Although it is extensive in scope, CrowdTangle does not track all public Facebook pages and groups. But, it also allows

researchers to request data about Facebook pages and groups which are not currently tracked by the tool.

Using CrowdTangle's Page Search function and Post Search API (Application Programming Interface), we identified public Facebook pages and groups related to BLM or its counter-movements. To identify a larger and more complete set of Facebook pages and groups supporting BLM and its counter-movements beyond the limited scope of CrowdTangle's database, we designed an iterative data collection method, inspired by snowball sampling methods. Specifically, we conducted keyword-based searching and identified all public Facebook pages or groups that contain "black", "live" (or "life"), and "matter"; "blue", "live" (or "life"), and "matter"; "white", "live" (or "life"), and "matter"; or "all", "live" (or "life"), and "matter" in their titles or web addresses. We downloaded all content created by Facebook pages and groups satisfying this keyword criterion and analyzed their Facebook posts. We also identified additional Facebook pages and groups that satisfied our keyword searching criteria but did not exist in CrowdTangle's database. We requested CrowdTangle to retrieve those newly identified Facebook pages and groups from Facebook and downloaded their content from CrowdTangle. We then again analyzed the posts from these newly downloaded Facebook pages and groups and identified other additional Facebook pages and groups. This iterative process was repeated three times until no additional Facebook pages or groups were identified.

It is possible that some Facebook pages and groups discussed BLM and counter-movements although their titles and addresses did not include some of the keywords. To capture these Facebook pages and groups, we additionally designed and conducted a process named "network-based searching." In this process, we analyzed all posts created by Facebook pages and groups identified during the keyword-based searching, extracted Facebook accounts that were

mentioned or referenced by at least five different Facebook pages and groups in our collected dataset, and downloaded content created by these frequently mentioned Facebook pages and groups.

The data collection took place between January 29th, 2021, and February 19th, 2021. After completing the data retrieval procedure, posts created before January 1st, 2013, or after November 30th, 2020 were removed from the collected dataset.

Evaluation of Group Valence

Based on the list of Facebook pages and groups collected during the aforementioned searching procedure, subject-matter experts visited each of the Facebook pages and groups and determined its orientation to the four movements explored in this study. Specifically, each expert reviewed the About section of a Facebook page or group and its most recent posts up to 25 posts. Each Facebook page or group was reviewed by two independent coders, and each coder classified each Facebook page or group into either a Black Lives Matter (BLM), counter-movement (CNT), or mixed views (Mixed) group. (1) The "BLM" category includes Facebook pages or groups that explicitly support Black Lives Matter or otherwise contain favorable attitudes toward the movement. (2) The "CNT" category includes Facebook pages or groups that explicitly support one or more counter-movements or otherwise contain favorable attitudes toward counter-movement(s). CNT groups were further categorized into White Lives Matter (WLM), Blue Lives Matter (Blue LM), All Lives Matter (ALM), and Anti-BLM groups. (3) The "Mixed" category includes Facebook pages or groups that supported both Black Lives Matter and one or more of the CNT group subcategories. A third coder was invited to resolve the conflict if there was a discrepancy between the two initial evaluations. Irrelevant Facebook pages and groups were identified during this evaluation process and removed from the dataset.

As a result, we identified 2,156 public Facebook pages and groups discussing BLM and counter-movements. These Facebook pages or groups generated 362,664 Facebook posts in total between January 1st, 2013, and November 30th, 2020.

Analysis of Information Sources

We analyzed information sources used by BLM and counter-movement groups. A Facebook post created by a Facebook page or group can include one or more URLs. Here, an "information source" refers to a web domain of a URL included in a Facebook post. For example, if a Facebook post of a Facebook page, X, included a URL, https://www.youtube.com/foxnews, we considered the domain, youtube.com, to be an information source for X. We further investigated the following subcategories of information sources: (1) *Government sources* included the .gov domains (gsa.gov, 2014), the U.S. government-managed non-.gov domains (Search.gov, 2019), and the 87 international government domains (Wikipedia, 2021). (2) *News sources* included "hard news domains" reported in Bakshy et al. (2015), "news media sites" listed in Yang et al. (2020), "newspapers" and "digital-native news outlets" listed by Pew Research Center (2019), and "green" and "yellow" domains reported by Grinberg et al. (2019). (3) *Social media sources* include domains of social media services that Pew Research Center identified as social media in at least one of the following reports between 2012 and 2020 (Duggan, 2015; Duggan et al., 2015; Duggan & Brenner, 2013; Greenwood et al., 2016; Holcomb et al., 2013; Perrin & Anderson, 2019; Shearer & Gottfried, 2017; Shearer & Mitchell, 2021; Smith & Anderson, 2018). (4) *Low credibility sources* include "black," "red," or "orange" sources reported in Grinberg et al. (2019), and "very low credibility" and "low credibility" domains reported by Media Bias and Fact Check (Media Bias/Fact Check, 2021). Media Bias and Fact Check (MBFC) is an "independent website that

rates the bias, factual accuracy, and credibility of media sources" (Media Bias/Fact Check, 2021).

Ideological Alignment and Counter-movement Affinity

We examined if groups with different standpoints relied on media sources with different political slants. First, for each information source, we calculated a counter-movement affinity score. A counter-movement affinity score indicates the degree to which a source was used more widely by counter-movement groups than BLM groups: A score of 1 indicates that a source was referenced only by counter-movement groups and not by any BLM groups, while a score of -1 indicates that a source was referenced only by BLM groups. A score of 0 means that a source was equally popular among BLM groups and counter-movement groups. (i.e., The proportion of BLM groups referencing the source among all BLM groups is equal to the proportion of counter-movement groups referencing the source among all counter-movement groups). Second, we used the alignment score reported in Bakshy et al. (2015) to measure ideological characteristics of each media source, which ranges between -1 (very liberal) and 1 (very conservative). The robustness of findings was checked by using different measures of ideological characteristics of sources, as discussed later in Results.

Results

Among BLM, CNT, and Mixed groups, BLM groups have been dominant on Facebook in terms of the number of Facebook pages and groups and the volume of content generated. Specifically, 85.8% (*SD* = 7.9%) of all posts each month were generated by BLM groups. The total number of posts produced by all groups showed a noticeable surge that coincides with the murder of George Floyd in May 2020 (see Figures 1A and 1B). Second, the majority of Facebook pages and groups have been supporting BLM. BLM groups accounted for 78.3% (*SD*

= 11.5%) of all active groups each month. There was a similar surge in the total number of active groups starting in May 2020 (Figure 1B). However, Figures 1A and 1B also show that counter-movement groups have maintained a non-negligible and stable presence on the platform for a considerable period of time.

On average, an active BLM group has created more posts than an active CNT group each year (Figure 1C). Regarding the lifetime of a group (the time between a group's first and last content publication), the average lifetime of BLM groups was 1.1 years (*SD* = 1.7 years), and it was 9.6% shorter than that of CNT groups, as displayed in Figure 1D.

In terms of Facebook users' engagements with content, we found that counter-movement groups attracted significantly more user engagements than BLM groups. The proportions of shares, comments, and reactions drawn by counter-movement groups have sharply increased in 2015. Since January 2016, these groups received 79.4% (*SD* = 22.5%) of all shares, 81.5% (*SD* = 23.8%) of all comments, and 84.4% (*SD* = 20.8%) of reactions each month on average (Figures 2A-C). The average numbers of shares, comments, and reactions per post were also greater for counter-movement groups than BLM groups every month since 2016 (Figures 2D-F).

Figure 3A shows the proportions of Anti-BLM, All Lives Matter (ALM), White Lives Matter (WLM), and Blue Lives Matter (Blue LM) groups among all counter-movement groups. When averaged over a 71-month period since January 2015, Blue LM, Anti-BLM, WLM, and ALM groups produced 67.6% (*SD* = 15.0%), 22.1% (*SD* = 10.1%), 8.2% (*SD* = 5.9%), and 2.1% (*SD* = 2.8%) of all posts respectively. Regarding the number of active groups, Blue LM, Anti-BLM, WLM, and ALM groups comprised 41.3% (*SD* = 11.9%), 37.4% (*SD* = 8.0%), 15.1% (*SD* = 5.4%), and 6.2% (*SD* = 4.1%) of active counter-movement groups in a given month respectively (see Figure 3B).

We compared BLM and counter-movement groups in terms of their reliance on external information sources known to supply misinformation (Grinberg et al., 2019; Guess et al., 2019) and other important types of external sources, including government sources (Brennen et al., 2020; Singh et al., 2020), social media sources (Vicario et al., 2017; Wilson & Starbird, 2020), and news sources (Bakshy et al., 2015; Grinberg et al., 2019; Guess et al., 2019; Pennycook & Rand, 2019). The proportion of posts using low credibility sources in a counter-movement group was only 1.3% (*SD* = 1.3%), although it was still greater than the average proportion in a BLM group, 0.3% (*SD* = 0.4%). We also found that sources representing more conservative and far-right political viewpoints were more widely used by counter-movement groups. Specifically, when a counter-movement affinity score was calculated for each information source, there was a significant and positive correlation between the score and the ideology alignment of a source, as Figure 4E indicates. We checked the robustness of this finding by replacing the ideology alignment score with two other measures of media political slants reported by MBFC and All Sides (www.allsides.com). The correlations between MBFC score and counter-movement affinity and between All Sides' score and counter-movement affinity were all statistically significant.

Discussion

The current research studied the activities of online groups supporting the BLM movement and counter-movements, focusing on the information ecosystem enabling the creation and diffusion of their narratives.

First, we identified that counter-movement groups have maintained a significant and stable presence on Facebook. The results show that counter-movements started to gain their momentum on Facebook around 2015, well before the Black Lives Matter protests saw a

nationwide surge in 2020. In general, this pattern of content creation we found on Facebook corresponded to those reported on other social media platforms, such as Twitter. For example, Anderson (2016) reported that the use of hashtags, #BlackLivesMatter, #AllLivesMatter, and #BlueLivesMatter, peaked in July 2016 at which point the critiques of Black Lives Matter see a dramatic rise. The patterns shown in Figures 1A and 1B display similar increases in July 2016. The result also shows that on average, counter-movement groups stayed active for a longer period of time than BLM groups, even though BLM groups generated more content than counter-movement groups did each year.

Second, the current study revealed that, while BLM dominated in terms of the number of posts, the number of active groups, and the number of posts created by each group each month, counter-movement groups attracted more engagement from Facebook users. Specifically, the aggregated number of user engagements (shares, comments, and reactions) with all posts is greater for counter-movement groups in comparison with BLM groups. In addition, on average monthly engagements with a post were greater for counter-movement groups than BLM groups. This is a crucial finding revealing that online groups opposing BLM attracted more cognitive and emotional reactions from Facebook users than groups supporting the movement for racial justice.

Several factors might contribute to this asymmetry. We may speculate that social media algorithms have amplified the reach and exposure of the content created by counter-movement groups. These algorithms might expose, suggest, or prioritize the content from counter-movement groups to a larger number of Facebook users than they did for the content from BLM groups. Another plausible explanation is that the disparity was caused by innate characteristics of content created by counter-movement groups. It is possible that online groups supporting counter-movements use more emotional or moral languages and sensitive images in their posts,

which might contribute to higher levels of user reactions (Brady et al., 2017). Although it is outside the scope of this study to investigate whether and how each of these potential factors helped counter-movement groups boost their influence on users, the present finding is still critical, showing that Facebook functioned as a giant megaphone for content against the racial justice movement.

Third, among the counter-movements, Blue Lives Matter appeared to be dominant on Facebook in terms of the number of groups and the volume of content produced. Anti-BLM was the second most prevalent type of counter-movement groups against BLM. Blue Lives Matter and Anti-BLM groups appeared to be two major forces against BLM: they were responsible for 90% of all counter-movement posts and 79% of all active counter-movement groups in a month. It is worth noting that White Lives Matter, which has been labeled a racist movement (Southern Poverty Law Center, 2016), has maintained a non-trivial presence and continues to grow, raising concerns about the mainstreaming of extreme content.

Fourth, the current research discovered that the counter-movement groups were more dependent on low credibility sources than BLM groups were. However, the influence of the low credibility sources was generally limited among both counter-movement groups and BLM groups, and on both sides, only less than 2% of posts included low credibility sources. The results also revealed that a significant amount of content produced by counter-movement groups referenced legitimate news media, and their reliance on social media recently surged in 2020. These pieces of evidence imply that it is important to probe beyond the presence of low credibility sources, and understand how hate groups actually interpret, combine, and mix information from legitimate news media and social media.

Fifth, the media use pattern shows that information flows are polarized, and counter-movement groups make significant use of far-right and extreme sources. The counter-movement groups relied significantly more on conservative and far-right news sources as well as low credibility information sources than the BLM groups did. This finding raises concerns about echo chambers forming within counter-movement groups. To what extent extremist content produced by movements like White Lives Matter circulates among counter-movement groups remains an important question for future investigation.

As with all independent and external attempts to examine private digital media platforms, the observational design of the current study necessarily accompanies some limitations. First, information about private Facebook groups, and removed or banned accounts is not available to researchers and thus was not considered in this research. Second, we were not able to isolate the effects of algorithms and platform-wide policy enforcement due to the lack of available data. Third, even though the present research collected an extensive set of Facebook pages and groups supporting a social justice movement and counter-movements against it, the reliance on proprietary tools makes it difficult to verify whether the data we collected is accurate and exhaustive. For example, the dataset that the researchers were able to obtain may underestimate the actual volume of extremist content circulating on the platform. Thus, we should be careful about generalizing the findings of the current study to the entire platform, other social movements, or other digital platforms. Lastly, the existing benchmark may underestimate the scope of misinformation overall, and this study points to the methodological challenges in identifying and measuring the prevalence of misinformation when the list of low credibility sources remains a constantly moving target.

Our investigation, despite these limitations, provides important insights into public discussion about and involvement with social movements in the digital sphere. This study shows that counter-movements have been benefiting from the technological infrastructure and the extensive user base of the world's largest social media platform. More importantly, the platform has been functioning as an amplifier of hateful narratives, boosting counter-movements' exposure to and engagement with the public. This study suggests that the increasing political polarization in society might be playing a critical role in the increasing divide around racial issues, supplying politically biased information sources that can be used to fuel biased and extreme narratives. The current study showcases that large-scale systematic investigations of social media platforms and their connections and interactions with the broader information ecosystem can provide critical and previously unknown evidence about the ecology and evolution of online groups causing social harms and deepening hate, distrust, and division in our society.

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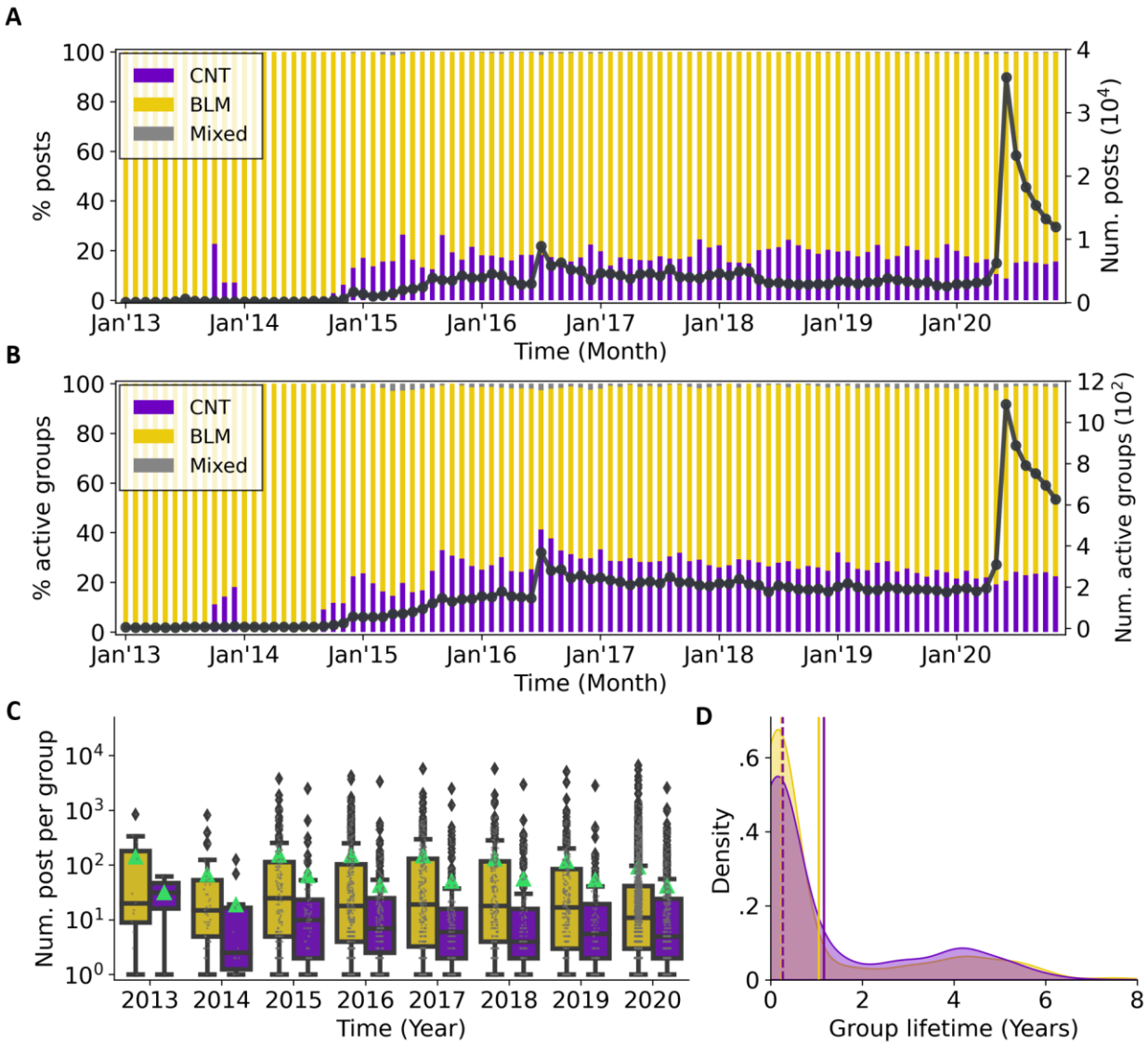
Figures

Figure 1

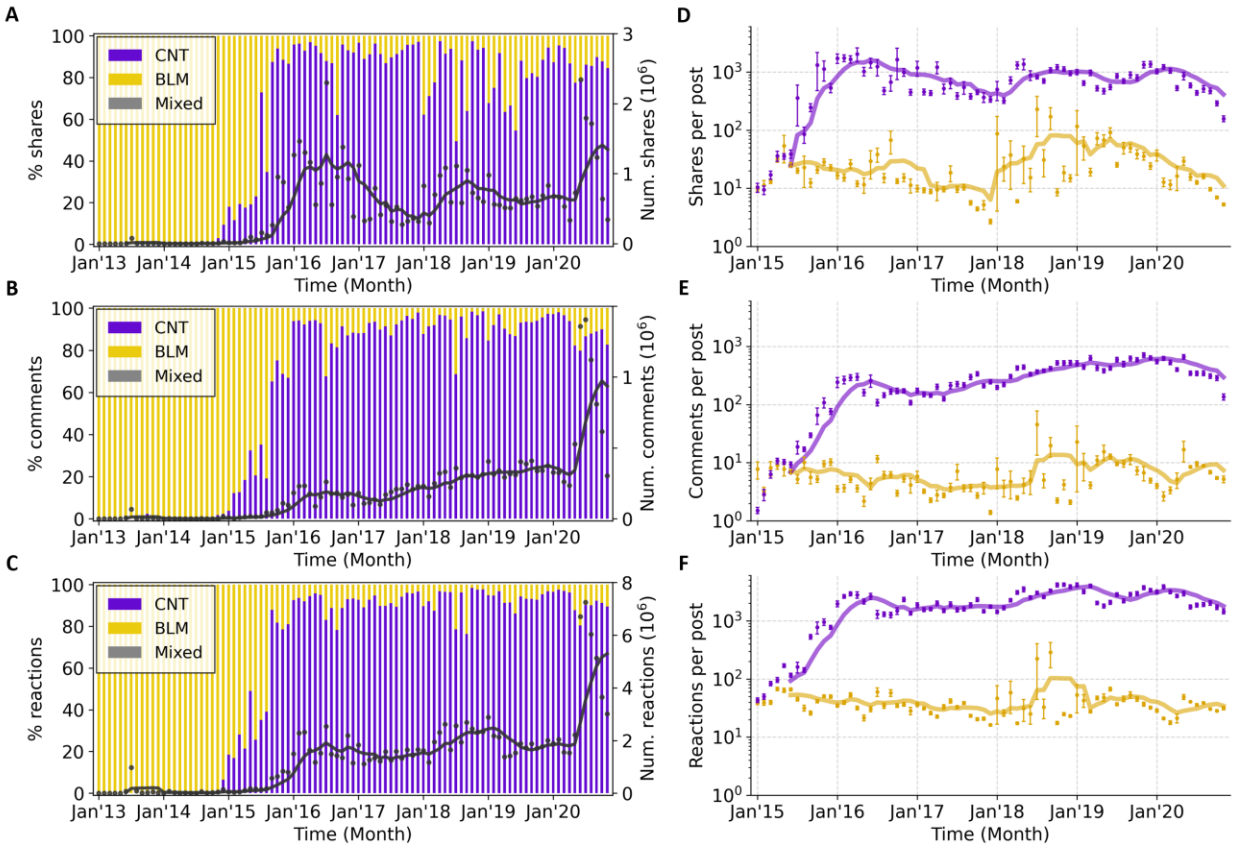
Prevalence of the Black Lives Matter and counter-movement groups on Facebook



Note. **A.** Posts produced by Facebook pages and groups. A stacked bar represents the proportions of Facebook posts created by BLM, counter-movements (CNT), and mixed-argument (mixed) groups in a given month (y-axis on the left). A dot indicates the total number of posts created by all Facebook pages and groups in a given month (y-axis on the right). **B.** Active groups. A stacked bar represents the proportions of active BLM, CNT, and mixed groups in a given month (y-axis on the left). A dot indicates the number of all active groups in a given month (y-axis on the right). **C**. Yearly posts per group. A box represents the distribution of the numbers of posts created by BLM and CNT groups in a given year. A triangle indicates an average, and each dot corresponds to an active group in a given year. **D**. Lifetime duration of groups. Yellow and purple represent BLM and CNT groups, respectively, and the solid and dashed lines refer to means and medians, respectively.

Figure 2

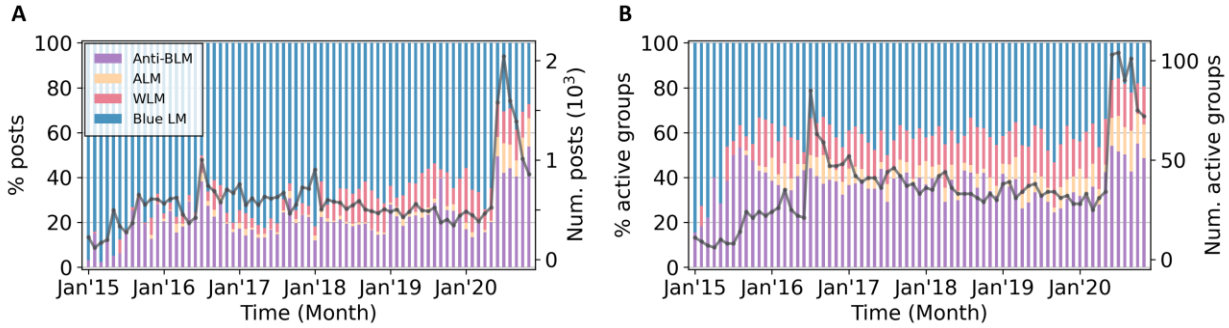
User Engagements of the Black Lives Matter and Counter-movement Groups on Facebook



Note. **A.** The proportion of shares. A stacked bar represents the proportions of shares that BLM, counter-movements (CNT), and mixed-argument (mixed) groups received in total in a given month (y-axis on the left). A dot indicates the total number of shares in a given month (y-axis on the right), and the curve indicates 6-month rolling averages of the monthly total number of shares. **B.** The proportion of comments. **C.** The proportion of reactions. **D.** The number of shares per post. A dot presents the number of shares of a post in a group in a given month, averaged among BLM (yellow) and CNT (yellow) groups. Error bars indicate ± s.e.m. A curve indicates 6-month rolling averages of the monthly average number of shares per post. **E.** The number of comments per post. **F.** The number of reactions per post.

Figure 3

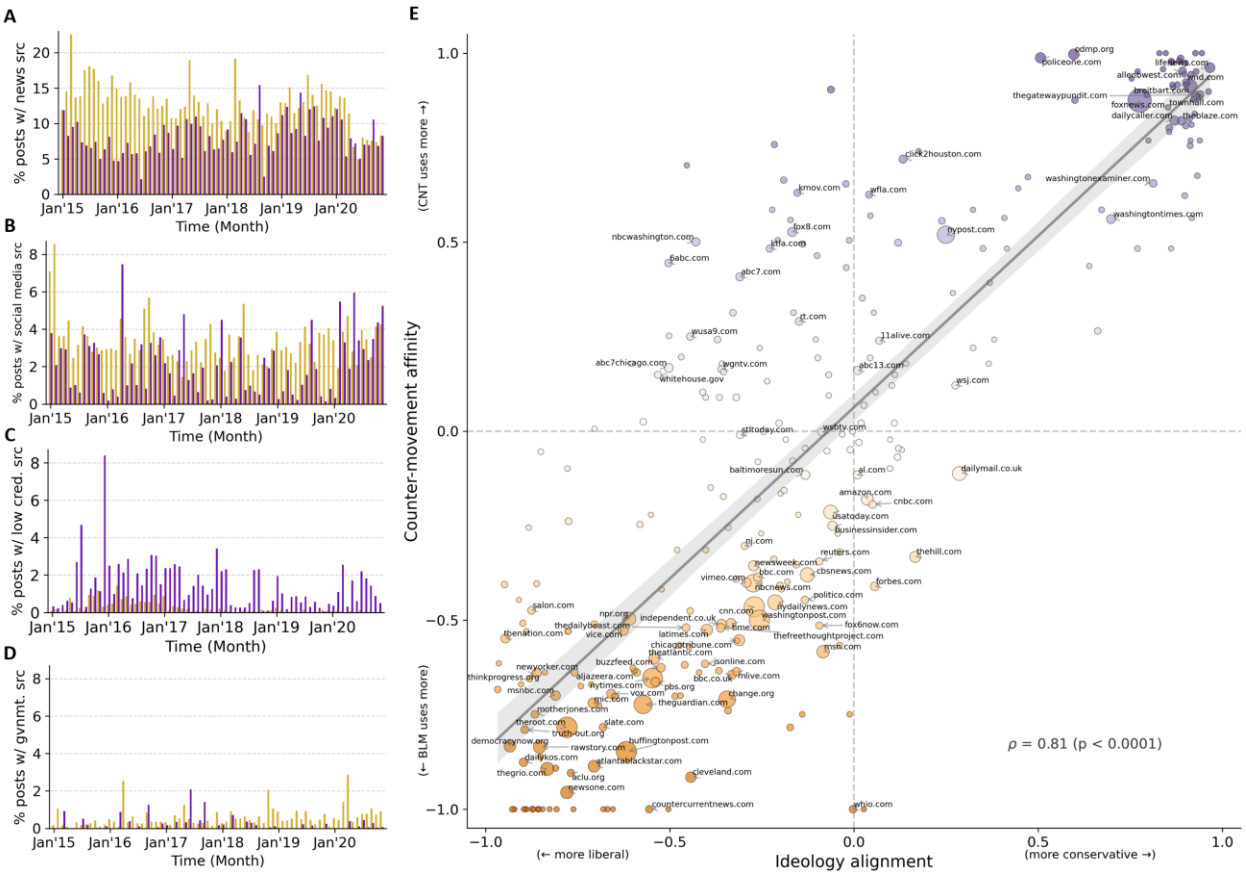
Prevalence of Counter-movement Subgroups on Facebook



Note. **A.** Posts produced by counter-movement groups. A stacked bar represents the proportions of Facebook posts created by Anti-BLM, All Lives Matter (ALM), White Lives Matter (WLM), and Blue Lives Matter (Blue LM) groups in a given month (y-axis on the left). A dot indicates the total number of posts created by all counter-movement groups in a given month (y-axis on the right). **B.** Active groups. A stacked bar represents the proportions of active Anti-BLM, ALM, WLM, and Blue LM groups in a given month (y-axis on the left). A dot indicates the number of all active counter-movement groups in a given month (y-axis on the right).

Figure 4

Information Ecosystem of Black Lives Matter and the Counter-movement Groups



Note. **A**. The averaged proportions of posts using news sources in an active Black Lives Matter (BLM) and the counter-movements (CNT) groups each month. Yellow and purple represent BLM and CNT, respectively. **B**. Social media sources. **C**. Low credibility sources. **D**. Government sources. **E**. Association between the ideological alignment and counter-movement affinity of sources. Each circle represents an information source. Ideology alignment scores were adopted from Bakshy et al. *(Bakshy et al., 2015)*. The color of a circle depends on the source's counter-movement affinity. The size of a circle is proportional to the average popularity of a source. The solid line represents the linear regression line relating the two scores, and the shade represents the 95% CI of its slope. N = 290.