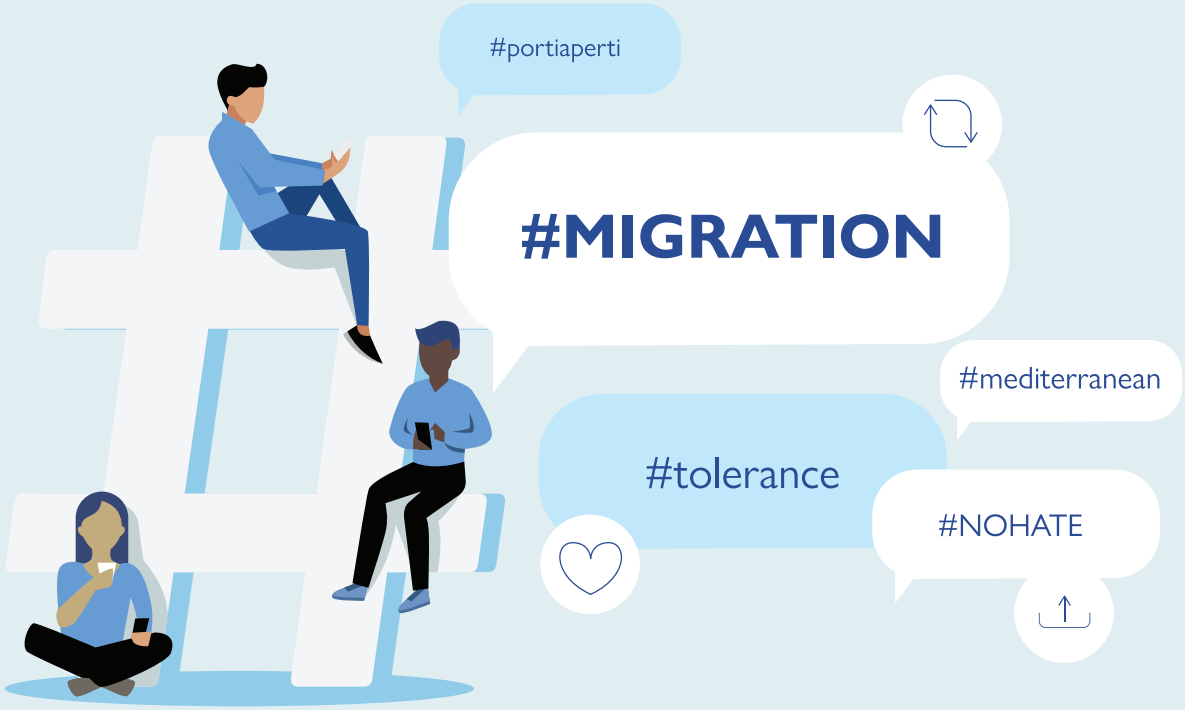
Sentiment towards Migration during COVID-19

What Twitter Data Can Tell Us



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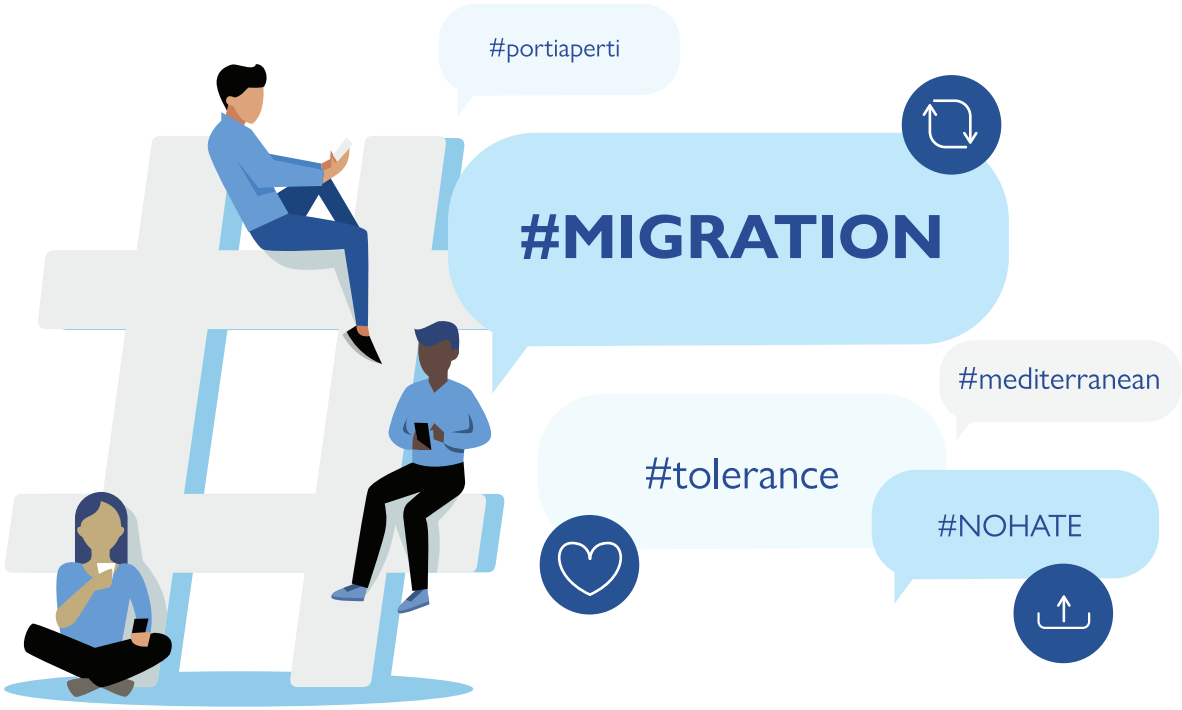

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GMDAC
IOM's Global Migration Data Analysis Centre

Bundesministerium des Innern, für Bau und Heimat

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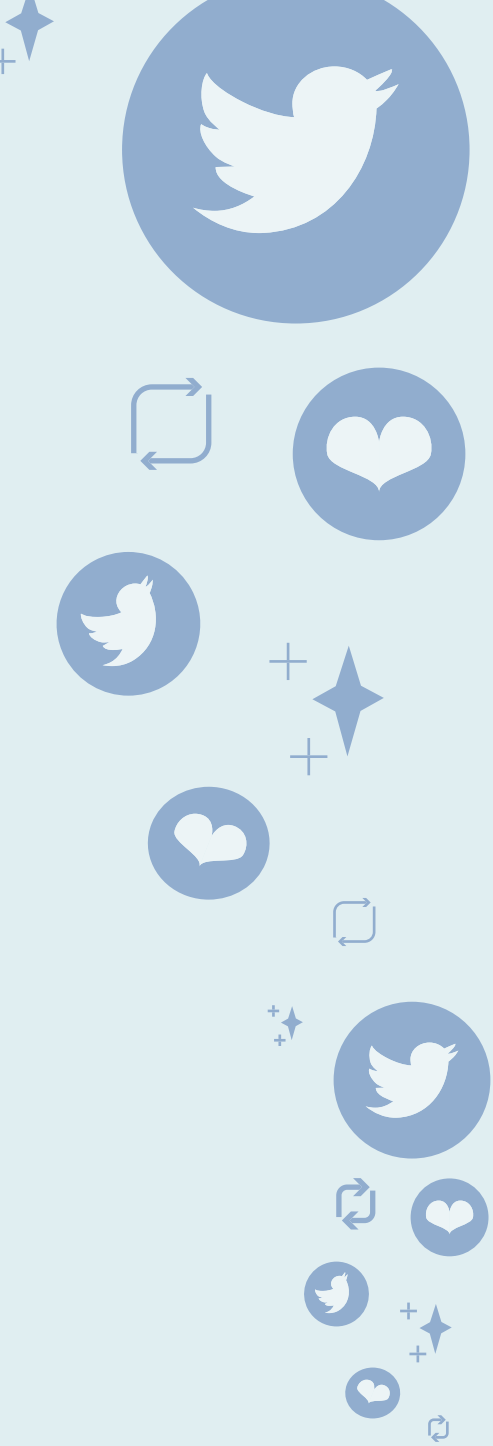
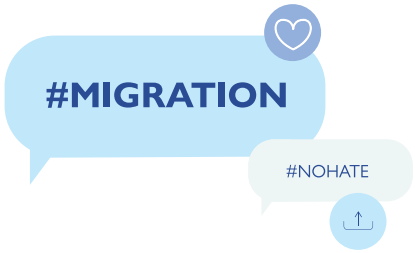
BIG DATA FOR MIGRATION ALLIANCE





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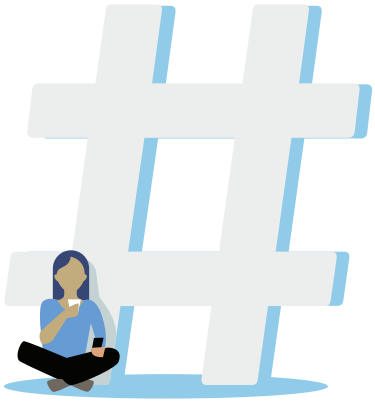


EXECUTIVE SUMMARY

- Since the start of the COVID-19 pandemic, reports of incidents of xenophobia and discrimination against migrants – particularly individuals of Asian descent – have increased worldwide. Yet the lack of accurate and timely data has prevented a large-scale analysis of these developments. This report introduces a novel framework for using Twitter data to measure and monitor shifts in public sentiment towards migrants, complementing traditional data sources.

- Drawing on a random sample of 30.39 million tweets across five countries – Germany, Italy, Spain, the United Kingdom and the United States of America – the report investigates changes in public discourse about COVID-19 and migration-related topics in the period December 2019–April 2020, using sentiment analysis and topic modelling. Specifically, the reports seek to: (a) measure the extent of xenophobia on Twitter; (b) identify trending topics associated with changes in xenophobic sentiments; and (c) assess how topics and sentiments changed over time.

- Results show a consistent trend of moderate negative sentiments towards migrants across all five countries in the period considered. However, negative sentiments do not appear to have increased significantly in the early stages of the COVID-19 pandemic, as tweets conveying negative sentiments were balanced out by tweets expressing positive sentiments. Occasional temporary shifts in public sentiment occurred. Spain stood out as the country with the largest daily negative sentiment scores associated with the topic of "racism and xenophobia".

- The analysis provides evidence of growing social polarization concerning migration, showing high concentrations of strongly positive and strongly negative sentiments. As social media is likely to reinforce and geographically extend this trend through "echo chambers", it becomes vital to investigate how negative sentiments towards migrants and misinformation spread across virtual networks, to counter discrimination and foster social cohesion.

- Users of Twitter (just like other social media platforms) are not representative of the population at large. This should always be kept in mind when interpreting results based on analyses of these data. Yet Twitter data can serve as a useful resource to monitor immigration-related sentiment in real or near real time, complementing data sources such as surveys, which can be comparatively slow, inaccurate and costly. Especially when used in combination with other data sources, these data can contribute to developing effective strategies to counter the spread of discrimination against migrants in emergency scenarios and, more broadly, in line with Objective 17 of the Global Compact for Safe, Orderly and Regular Migration: "Eliminate all forms of discrimination and promote evidence-based public discourse to shape perceptions of migration."

- The report recommends further harnessing social media to develop large-scale analytical frameworks for monitoring public sentiment and narratives around migration and informing policy interventions adequately, in anticipation of future shocks and emergency scenarios at the national, regional and global levels. It also highlights the need for further research focusing on: (a) how to address the inherent selection bias in uses of social media data to analyze public opinion about migration and other migration topics; and (b) how to successfully integrate various data sources – both traditional and nontraditional – in the analysis of migration-related phenomena.

INTRODUCTION

At the beginning of 2020, the coronavirus pandemic started posing unprecedented challenges to societies worldwide. Governments, international organizations, private companies, national statistics offices, research institutions and the civil society established large-scale efforts to tackle the emergency and its health and economic implications. Meanwhile, xenophobic and discriminatory incidents, particularly against individuals of Asian descent, began rising (FAO, 2020; HRW, 2020; ILO, 2020; Hennebry and KC, 2020; *Nature*, 2020; United Nations, 2020). Wikipedia (n.d.) has a new dedicated page documenting key racist and xenophobic incidents around the world. Acts and displays of intolerance, discrimination, racism, xenophobia and violent extremism have emerged, linking individuals of Asian descent and appearance to COVID-19 (Coates, 2020; *Nature*, 2020).

Xenophobia is described as "attitudes, prejudices and behaviour that reject, exclude and often vilify persons, based on the perception that they are outsiders or foreigners to the community society or national identity" (ILO et al., 2001:2). The impacts vary across sectors and regions. Yet experiences of discrimination are common among migrants, especially of certain groups, and may be exacerbated in times of public health or economic crisis (IOM, 2020a). Understanding damaging narratives and what shapes them is vital to prevent the spread of misinformation and misperception (European Commission, 2019), which can erode social cohesion and harm societies worldwide, well beyond the pandemic. This is why one of the 23 objectives of the Global Compact for Migration – the first-ever intergovernmental agreement on international migration – is to "[e]liminate all forms of discrimination and promote evidence-based public discourse to shape perceptions of migration". While all forms of mass communication can contribute to spreading misinformation, fearmongering and racial stereotyping, social media has played a critical role in fuelling xenophobic attitudes during the pandemic (Posetti and Bontcheva, 2020). Social media provides a global platform that can be easily misused for circulating inaccurate or outright false information and prejudices that may eventually spill onto the streets (IOM, 2020b; Cowper, 2020).

Traditionally, qualitative and quantitative data on public perception and attitudes towards migrants are gathered through ethnographies, surveys and interviews (Rowe et al., 2021). However, these data sources have several limitations. Qualitative methods rely on small samples and normally suffer from sample bias (Atieno, 2009). Similarly, while surveys can provide a reliable national representation, they are expensive and infrequent, offer low population coverage, lack statistical validity at fine geographical scales, and become available with a lag of one or two years after being collected (Atieno, 2009). New data sources such as social media offer opportunities to complement traditional data sources and alleviate these shortcomings. Globally, 53 per cent of the world population (over 4.1 billion people) were estimated to be active social media users by October 2020 (Hootsuite and We Are Social, 2019), making them part of digital communities that share opinions and information at an unprecedented speed and volume (McCormick et al., 2017). Supported by algorithm-enabled analyses, these new data can be used effectively and responsibly to understand shifts in public debates and sentiment towards migration close to real time (Freire-Vidal and Graells-Garrido, 2019).

In late 2020, IOM's Global Migration Data Analysis Centre and the University of Liverpool set out to explore possible shifts in public sentiment towards migrants during the early stages of the COVID-19 pandemic (from December 2019 to April 2020) in five countries (Germany, Italy, Spain, the United Kingdom and the United States), using Twitter data. Specifically, the project sought to: (a) determine whether and to what extent discrimination against migrants intensified as COVID-19 spread in the five countries; (b) identify central topics associated with xenophobic sentiments; and (c) assess how these topics and sentiments changed over time. The analysis draws on a country-stratified random sample of 30.39 million tweets across the five countries that recorded the world's largest numbers of COVID-19-related deaths by the end of April 2020 and have among the largest Twitter user bases globally (Statista, 2020).

This report briefly discusses the evidence on COVID-related xenophobia and uses of Twitter data for research purposes. It then outlines the methodological approach used for this analysis and describes the results obtained for the five selected countries. It concludes by discussing some key policy implications and suggesting ways to build a systematic approach to monitoring xenophobia using Twitter data and contributing to a more balanced public debate about migration.

BACKGROUND

Prejudice, discrimination and stigmatization during pandemics are not new. In the 1300s, Jews were persecuted during the Black Death (Link and Phelan, 2006); in the 1980s, LGBTQI individuals were stigmatized during the HIV outbreak (Malcolm et al., 1998; UNAIDS, 2019); and in 2014, the Ebola outbreak was labelled as an "African disease" (*UN News*, 2014). As COVID-19 unfolded in Europe in early February 2020, mounting fear and misinformation led to a rapid spread of xenophobic rhetoric, particularly directed at individuals of Asian descent (OECD, 2020). This rhetoric quickly disseminated through news media coverage and social media platforms across the world via articles explicitly blaming China for the COVID-19 outbreak or associating the country with it (Coates, 2020; Cowper, 2020; HRW, 2020). Former US President Donald Trump demonstratively used the terms "Chinese virus" and "kung flu" (Mangan, 2020); Eduardo Bolsonaro, son of Brazilian President Jair Bolsonaro, called the pandemic "China's fault" (Phillips, 2020). Narratives soon translated into action, with growing episodes of social exclusion and violence. For instance, the United Kingdom reported a 21 per cent increase in hate crimes against Asian communities during the first lockdown period (House of Commons, 2020; *Nature*, 2020).

The xenophobic rhetoric has met a contrasting wave of positive sentiments towards migration, recognizing the key role of migrant workers in front-line occupations during COVID-19, such as social care, health, essential retail and food production (Fasani and Mazza, 2020; Gelatt, 2020). Information campaigns have also been put in place to tackle emerging anti-immigration narratives related to COVID-19. The United Nations, for instance, issued a set of recommendations to address and counter hate speech related to COVID-19 (United Nations, 2020). In Germany, an anti-discrimination agency launched a dedicated campaign to raise awareness of the rise of anti-Semitism and racism (OECD, 2020). In Finland, the Government launched a nationwide campaign to tackle misconceptions about COVID-19 on social media (OECD, 2020:21). In France, actions have been taken to accelerate naturalization processes for immigrants working in the front line during COVID-19 (OECD, 2020:21), and in the United Kingdom, front-line health-care workers have been exempted from paying an immigration health surcharge required for temporary visa applications (Gower, 2020).

Monitoring the evolution of xenophobic and discriminatory attitudes in a timely manner is essential to implement measures that can counter misinformation, defuse social tensions and promote better social cohesion. However, measuring public sentiment towards migrants on the national and international levels is a difficult endeavour. Despite the abundance of surveys of public opinion on migration around the world – especially in high-income regions – survey data can hardly capture nuances in opinions or sentiments about a complex and multifaceted topic such as migration. Typically, cross-country surveys of public attitudes towards migration revolve around questions such as citizens' perceptions of immigrants and the impact of migration on their countries, general attitudes towards diversity, or preferences with regard to national migration policies (IOM, 2018).

For instance, the Gallup World Poll – one of the key sources of data on public attitudes towards migration globally – includes questions such as whether people think immigration levels in their countries should increase, decrease, or stay at present levels; or whether people think immigrants are in competition with nationals in the labour market; or again, how people feel about immigrants living in their neighbourhoods. On the global level, the IOM report *How the World Views Migration* – based on data from the Gallup World Poll collected across more than 140 countries in 2012–2014 – showed that on average, only 21 per cent of the respondents favoured increasing immigration levels, whereas 34 per cent would like to see lower levels of immigration in their countries, and 22 per cent agree to keeping the current levels (IOM, 2015).[1] In Europe, comparative studies showed decreasing trends of anti-immigration sentiments across all 27 European Union member States and the United Kingdom between 2014 and 2018, on average, although people in Southern European countries and the United Kingdom tend to favour a decrease in immigration levels (Dennison and Geddes, 2019). In the United States, only 24 per cent of the people interviewed in 2019 stated that they prefer lower immigration levels in the country (Budiman, 2020).

Despite the value of these insights in analysing broad trends in public opinion over time and across countries, surveys cannot provide a full account of public sentiment towards immigrants. Migration is a highly complex issue comprising different dimensions (economic, cultural, social and political) and referring to different groups of individuals, while commonly used polls tend to refer to immigration as a singular issue (IOM, 2018). Respondents may have different views about different types of migration or different groups of migrants (for instance, they may be more concerned about undocumented migration rather than regular migration). Also, the way in which the questions are asked is likely to cause bias in the results (IOM, 2018:77).

Twitter data offer a new pathway in this field. These data provide qualitative insights into very large and fine-grained spatial and temporal scales that can potentially supplement some of the limitations of traditional data sources. Whereas survey data tend to be slow, costly, and often not fully representative of national or international societies (Rowe et al., 2021; Atieno, 2009), Twitter data are collected in real time, globally, and include qualitative information based on tweets, hashtags, user accounts, likes, emojis and retweets. Although Twitter data present a set of challenges, as discussed further below, previous studies have demonstrated their value for policy-relevant research. For instance, data from Twitter have been used to measure the spread of diseases (Achrekar et al., 2011), misinformation (Vosoughi et al., 2018), political polarization (Conover et al., 2011), displacement in the aftermath of natural disasters (Bruns and Liang, 2012), and population movements (Zagheni et al., 2014). Twitter data have also been used to study public sentiment towards immigrants, measuring both short-term changes in response to political events (UN Global Pulse and UNHCR, 2017; Freire-Vidal and Graells-Garrido, 2019) and long-term changes as a result of slower policy and narrative shifts (Flores, 2017). Coupled with artificial intelligence and machine learning tools and methodologies, Twitter represents a promising tool for measuring changes in public sentiment towards migrants.

[1] In this study, 22 per cent of the respondents indicated not having an opinion on this question.

HARNESSING TWITTER DATA FOR MEASURING PUBLIC SENTIMENT TOWARDS MIGRATION

The data set used in this analysis comprises a country-stratified random sample of 30.39 million tweets across Germany, Italy, Spain, the United Kingdom and the United States, posted in the period from 1 December 2019 to 30 April 2020. More specifically, we collected 1,500 tweets per day during the peak hour of Twitter activity via an application programming interface (API) for each country based on a systematic review strategy (Campbell Collaboration, n.d.), using migration-related key terms (see Appendix 1) and geographical and language parameters. All tweets were translated into English using the Google Cloud Translation API (Google, n.d.), ensuring the identification of similar topics across countries and languages (Grün and Hornik, 2011).

As a first analytical step, we conducted a *sentiment analysis* – also known as opinion mining or emotion artificial intelligence – to identify whether opinions expressed in the tweets were positive, negative or neutral. Through an approach known as Valence Aware Dictionary and sEntiment Reasoner (VADER),[2] algorithms assigned a score to every word in a tweet, ranging from -4 (extremely negative) to +4 (extremely positive), and then aggregated and normalized these scores to range between -1 and +1. The daily average of the composite score (> 0.05 for positive tweets and < -0.05 for negative tweets) allowed us to track the daily evolution of public sentiment towards migrants on Twitter.

As a second analytical step, we used *topic modelling* – a form of natural language processing – to categorize the tweets into 12 distinct migration-related topics[3] that were trending during the study period (Grün and Hornik, 2011; Curiskis et al., 2020). These topics were compiled through

[2] VADER is a lexicon and rule-based sentiment analysis tool, which has performed best compared to 11 other tools that identify polarization in tweets (Hutto and Gilbert, 2014).

[3] We decided on the number of topics by applying "ldatuning" (Moor, 2020), which is an R package that calculates how well LDA is able to group data into distinct topics, using metrics developed by Arun et al. (2010), Cao et al. (2009), Deveaud et al. (2014), and Griffiths and Steyvers (2004).

the Latent Dirichlet Allocation (LDA)[4] tool by identifying collections of words presenting as little overlap among each other as possible. To reduce interfering influences of unidentifiable or irrelevant tweets, we assigned those into a miscellaneous topic and a noise topic, respectively. As results, LDA quantified the prevalence of each topic across the tweets, along with the probability of words occurring in these topics, giving us additional qualitative insights into public sentiment towards migration.

Table 1. Tweets collected across the five countries and number of users, December 2019–April 2020

30 million TWEETS | **5** COUNTRIES | 1 DECEMBER 2019–30 APRIL 2020

	UNITED STATES	UNITED KINGDOM	ITALY	SPAIN	GERMANY
Total tweets	12.5 million	11.9 million	3.3 million	1.7 million	914 700
Retweets	12.3 million	11.8 million	3.2 million	1.6 million	797 300
Original content tweets	220 700	135 300	104 800	122 800	117 400
Average daily tweets	82 400	79 500	21 600	11 400	6 000
Unique users	103 800	56 200	25 400	53 800	24 200

This approach presents its own challenges and limitations. First, although VADER has been attuned to capture sentiment in contrasting statements (e.g. "immigration is *great* though it can have a *negative* impact on housing prices"), some statements may still be mis-scored depending on the combinations of words used for contrasting expressions. Second, it tends to misinterpret sarcastic tweets as negative sentiments as the identification and scoring of sarcastic statements remain a key challenge in natural language processing; however, these expressions generally account for a small fraction of all tweets (Flores, 2017; Freire-Vidal and Graells-Garrido, 2019). Further, and importantly, Twitter users are not representative of a country's population at large, as they tend to be overrepresented by younger age groups and particular ethnicities and socioeconomic statuses (Wojcik and Hughes, 2019; Sloan, 2017). Gauging the wider generalizability of the findings presented in this report is therefore challenging, although emerging approaches of using demographic sample weights can help overcome this issue (McCormick et al., 2017).

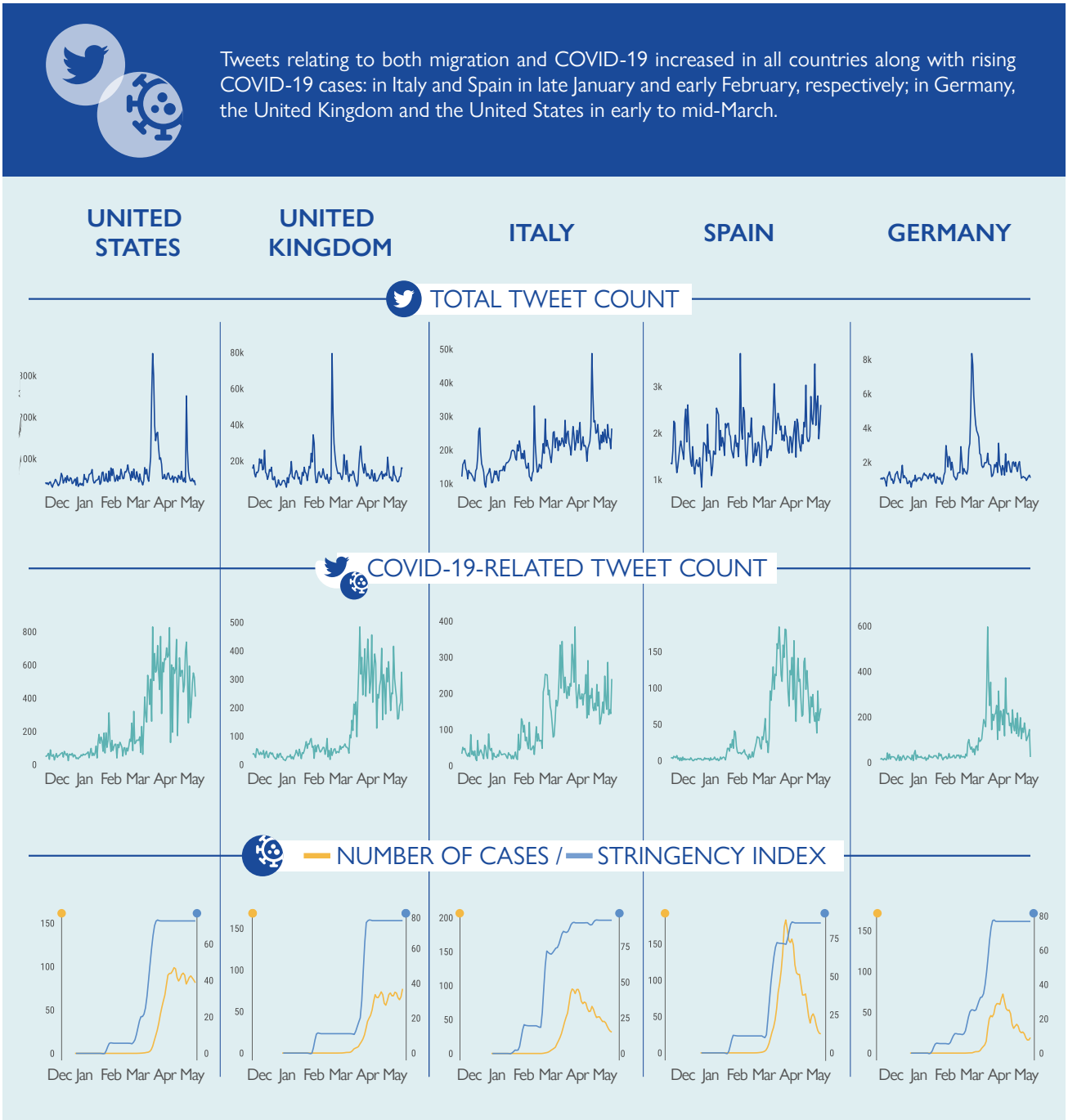
[4] LDA is an unsupervised topic modelling approach (Blei et al., 2003) that performed well for classifying tweets (del Gobbo et al., 2020; Godin et al., 2013; Negara et al., 2019; Ostrowski, 2015).

MIGRATION-RELATED PUBLIC SENTIMENT AND TRENDING TOPICS ON TWITTER

The extent of migration-related tweet activity

Figure 1a shows the total number of tweets containing at least one of our search terms between 1 December 2019 and 30 April 2020, capturing all the tweet activity relating to migration. Of this total, Figure 1b reports the number of tweets associated with a curated list of COVID-19 terms assembled by Twitter via a dedicated COVID-19 stream API (Twitter, 2020), to capture all tweet activity relating to immigration and COVID-19. Figure 1c displays the number of new COVID-19 cases per million and a stringency index, which is part of the Oxford COVID-19 Government Response Tracker (OxCGRT), and measures the extent of COVID-related government restrictions (Petherick et al., 2020) – a higher index reflects a higher level of restrictions.

Figure 1. Tweet activity related to migration and COVID-19 across the five countries, December 2019–April 2020



Notes: Details about the selection of tweets reported are provided in Appendix 1. Number of cases refers to the number of new COVID-19 cases per million. The stringency index measures the level of government responses to COVID-19 such as social distancing and lockdown measures, and it ranges from 0 (no measures) to 100 (the strictest possible scenario).

The results show that the overall migration-related tweet activity was consistent with several sudden spikes during key events, except for Spain, which displays higher variability. Comparatively, Italy, the United Kingdom and the United States showed more intense migration-related tweet activity than Germany and Spain in terms of volume. Tweets relating to both migration and COVID-19 escalated in all countries along with rising COVID-19 cases – in Italy and Spain in late January and early February, respectively; in Germany, the United Kingdom and the United States in early to mid-March. In Italy, the United Kingdom and the United States, high tweet activity remained until the end of the study period (30 April 2020), unlike in Germany and Spain where it gradually declined towards the end of the period.

Public sentiment towards migrants on Twitter

Figure 2 shows the overall distribution of sentiment scores between December 2019 and April 2020. Negative sentiments towards migrants were predominant in all five countries, particularly in Spain and, to a lesser extent, in Italy. These findings are consistent with existing research indicating predominantly negative attitudes in Southern European countries and the United Kingdom (Dennison and Geddes, 2019; Heath et al., 2020), and a pattern of declining but persistent opposition to immigration in the United States (Heath et al., 2020). Additionally, the chart reveals cyclical patterns of short-term fluctuations, signalling quick reactions to key sociopolitical or health-related events.

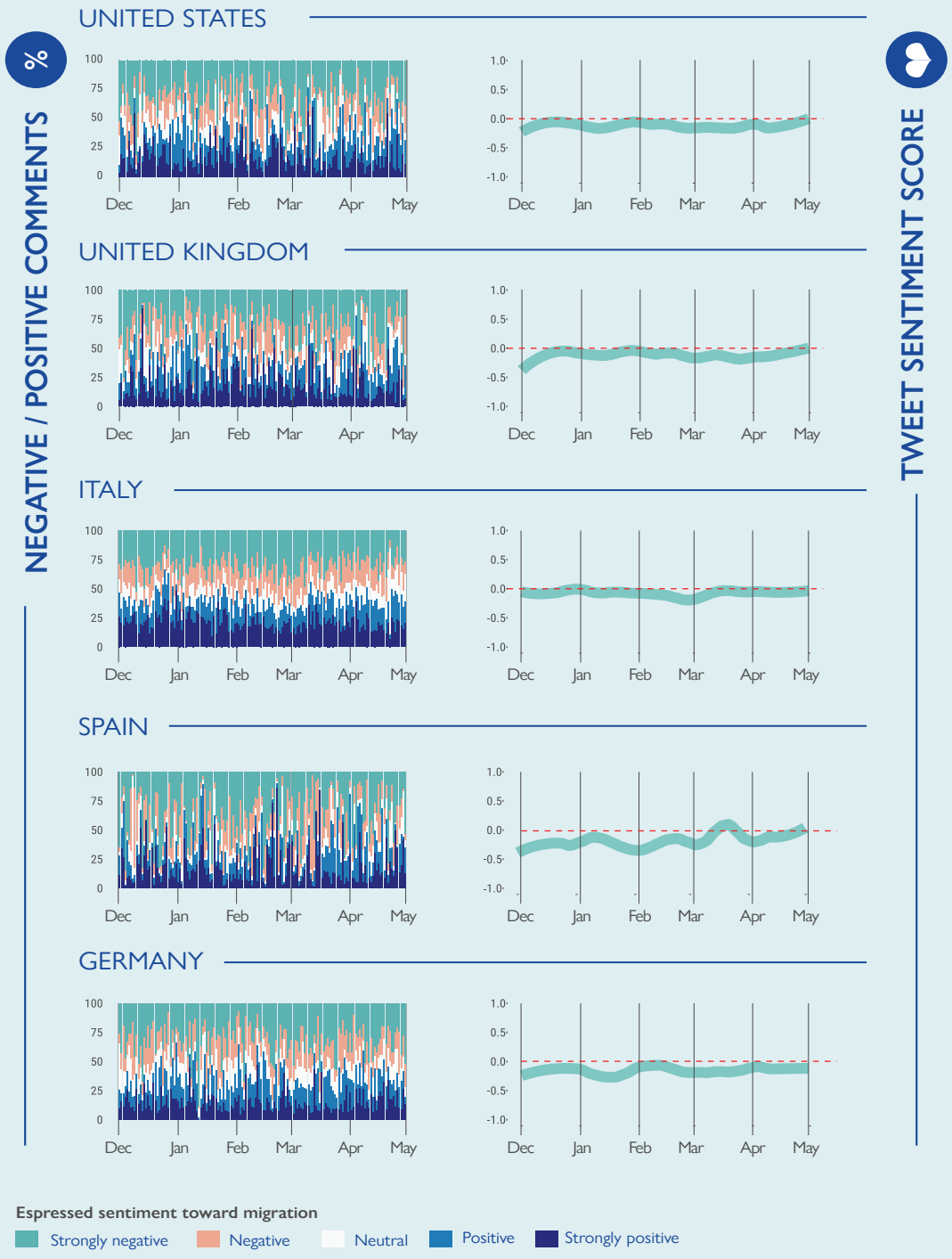
Results also show that as the number of COVID-19 cases increased in late February to mid-April, negative sentiments towards migrants in Germany, the United Kingdom and the United States moderately increased. However, during this period, tweets conveying negative sentiments were also met by an increase of tweets associated with positive sentiments towards migrants, highlighting migrants' essential roles in the health-care, food and agriculture, and hospitality sectors during the pandemic (ODI, n.d.; Fasani and Mazza, 2020; Gelatt, 2020). Overall, 30 per cent and 18.6 per cent of all tweets were identified as very negative (-0.5 to -1) and very positive (0.5 to 1) respectively, and only 13.1 per cent were neutral, 18.1 per cent moderately negative and 16.4 per cent moderately positive. This breakdown seems to reflect a wider trend of social polarization on controversial issues, with immigration featuring as a key divisive topic in each of the five countries considered. Among the five countries, Spain seems to be the most polarized, as strongly negative sentiment scores account for 37.6 per cent of the total volume of tweets, while the share of strongly positive sentiment scores is 20 per cent. These findings seem to corroborate existing research stating that social divisions have become increasingly aligned with partisan identities in recent years (Dennison and Geddes, 2019), and this is attributed to "echo chambers" on social media, which reinforce pre-existing beliefs through single-sided information exposure (Bail et al., 2018; Conover et al., 2011; Hong and Kim, 2016).

Trending topics influencing shifts in public sentiment

To identify the narratives underpinning changes in migration-related sentiment, we identified 12 trending migration-related topics through topic modelling. This provides further qualitative insights to better understand prevailing public sentiment and the evolving patterns during the early stages of the COVID-19 pandemic. Table 2 shows an overview of the topics derived from the topic-modelling approach, and Figure 3 presents a breakdown of when and to what extent these were discussed in each country. The analysis reveals a consistent prevalence of certain topics in each country.

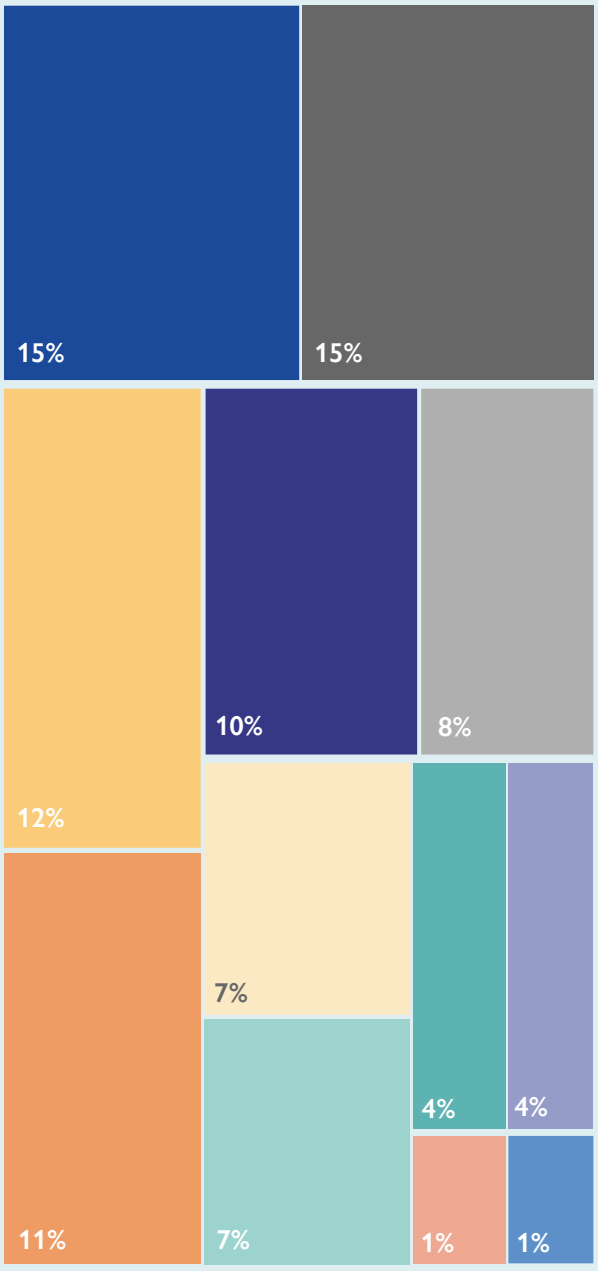
Figure 2. Sentiment towards migration on Twitter (average score and percentage of tweets expressing negative or positive sentiment) across the five countries, December 2019–April 2020

Negative sentiment towards migration prevailed in the five countries, particularly in Spain and – to a lesser extent – Italy.



Notes: (a) Average overall sentiment score. Smoothed conditional means are reported and were estimated via locally weighted scatterplot smoothing (LOWESS) using a span of 0.3. Grey background dots represent daily individual tweet sentiment scores. (b) Percentages of sentiment scores are classified as strongly negative (< -0.5), negative (-0.5 to -0.05), neutral (-0.05 to 0.05), positive (0.05 to 0.5) and strongly positive (> 0.5).

Table 2. Overall presence of the top 12 migration-related topics on Twitter across the five countries



COVID-19 EAST ASIAN PREJUDICE
Tweets containing COVID-19-related prejudices against individuals of Asian and particularly Chinese descent.

HUMAN RIGHTS ABUSES
This cluster comprises tweets reporting human rights abuses, including harassment, sexual abuse, homicide, torture, oppression of civil liberties and genocide. A particularly prominent theme is the detention and deportation of migrants and refugees on the United States' southern border.

TRUMP
Discussions about the Trump Administration and its stance on immigration.

UNDOCUMENTED IMMIGRATION
Expressions of animosity towards undocumented immigrants.

VULNERABLE EU MIGRANTS
Views about immigrants and refugees in detention and holding camps in Southern Europe, particularly Greece and Turkey.

MIGRANT BOAT CROSSING
Tweets about migrant boat crossing, relating to the United Kingdom, Spain and particularly Italy.

RACISM AND XENOPHOBIA
Racism and xenophobia related to alt-right politics.

BREXIT
Brexit and its impact on migrants.

ACTIVISM
Activism around various social issues – such as racism, sexism, ableism and homophobia – is linked to migration. The prominent term is a hashtag: #LeaveNoOneBehind.

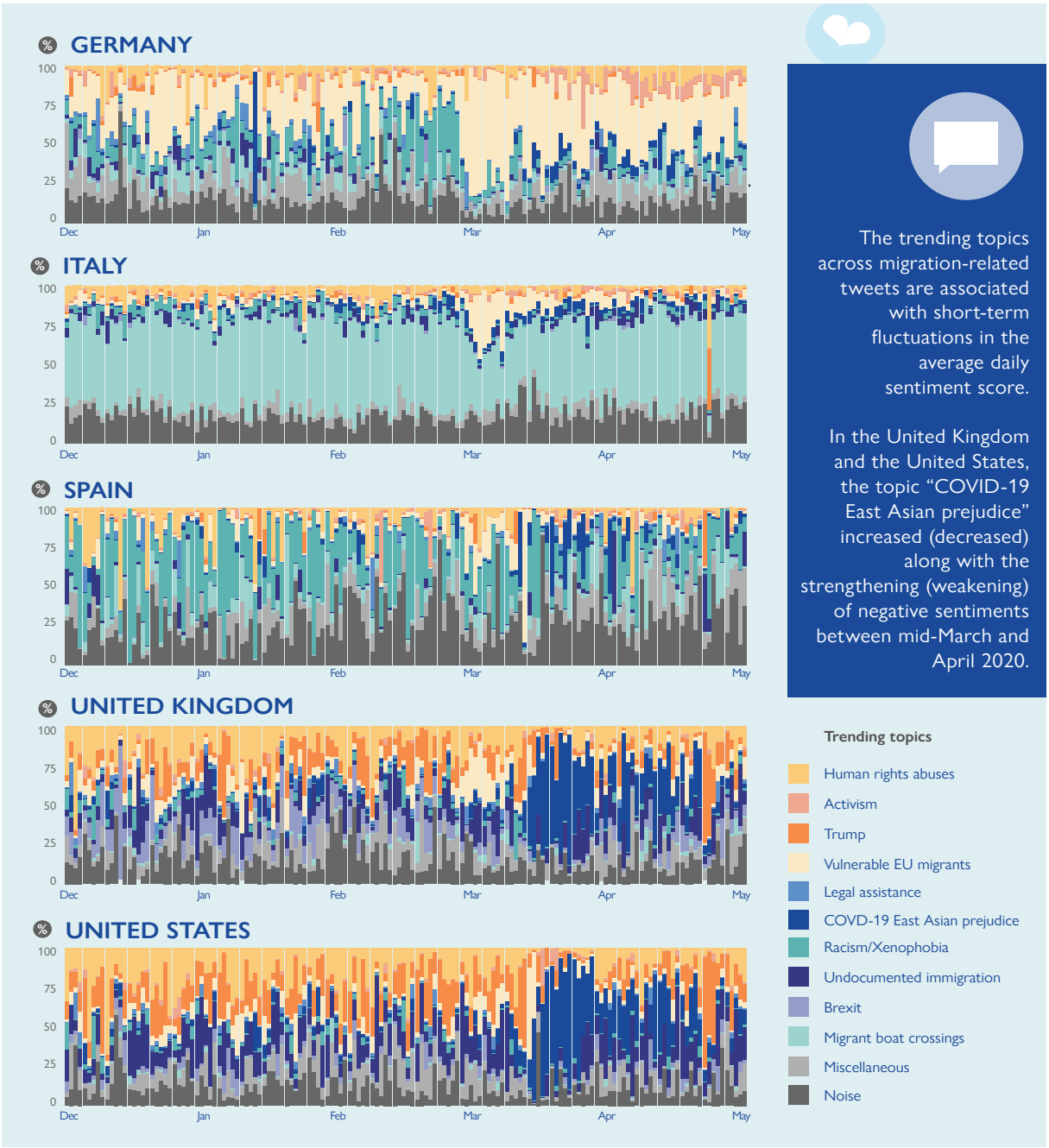
LEGAL ASSISTANCE
Tweets discussing migration-related legal issues, such as communicating changes in immigration laws (e.g. visa applications).

MISCELLANEOUS
Includes various tweets related to migration that could not be easily assigned to other categories. A prominent theme is advertisements for events relating to migration, including lectures, debates, academic publications and opportunities at research institutions.

NOISE
Tweets considered not relevant to migration filtered from topics 5, 9 and 11. It includes themes such as commercial law, United Kingdom's politics and adverts for non-migrant events which are neutral in sentiment.

In Germany, "vulnerable EU migrants" appears as the dominant topic, comprising 39 per cent of all tweets, reflecting concerns about migrants' health and safety conditions in camps and detention facilities in Greece and Turkey. In Italy, the topic of "migrant boat crossings" is most prevalent, accounting for 52 per cent of all tweets. This topic reflects the ongoing debate around boat crossings in the Mediterranean. In Spain, the topic "racism and xenophobia" is most prevalent (33% of total tweets), reflecting the high degree of negative sentiments towards migrants observed in Spain. In the United Kingdom and the United States, the most prevalent topic is "COVID-19 East Asian prejudice", followed by "Trump", "human rights abuses" and "undocumented immigration" – all of which account for over 10 per cent of each country's total tweet count. "Brexit" also features as a key topic in the United Kingdom, with 7.7 per cent of all tweets.

Table 3. Trending migration-related topics on Twitter during the early stages of COVID-19 across the five countries



The trending topics across migration-related tweets underpin some observed short-term changes in the average of overall daily sentiments towards migrants. For instance, in the United Kingdom and the United States, the topic "COVID-19 East Asian prejudice" increased (decreased) along with the strengthening (weakening) of negative sentiments between mid-March and April 2020. Specifically, on 17 March, former US President Trump described the pandemic as a "Chinese virus" (Kuo, 2020). In Germany, the topic "COVID-19 East Asian prejudice" had very little prominence, but we recorded an increase in negative sentiments during late February and early April. What seems to have driven this increase is a rise in tweets relating to the "vulnerable EU migrants" topic. During this period, this topic comprised between 35 and 52 per cent of all tweets in Germany. Further, between the end of February and early March, all five countries showed increased negative sentiments in correlation with the prevailing topics of "Trump", "vulnerable EU migrants" and "undocumented immigration", just shortly after Turkey decided to let 4 million migrants into Europe in early March (Bhatti and Apostolou, 2020; Rankin, 2020).

IMPLICATIONS FOR POLICY AND AREAS OF FUTURE WORK

The COVID-19 pandemic has brought about enormous public health and socioeconomic challenges worldwide and initially triggered a wave of anti-migrant rhetoric and discrimination. To develop effective countermeasures against misinformation and promote a balanced debate on migration, policymakers require robust and scalable insights to adequately define the problem. Yet the available traditional data often do not suffice for timely and detailed analyses of public sentiment towards migrants. In this regard, innovative data sources and methodologies can provide valuable complementary insights for policymakers, as outlined in IOM's *Practitioners Guide on Harnessing Data Innovation for Migration Policy* (forthcoming).

Drawing on Twitter as a novel data source, we analysed sentiments around migration expressed through a total of 30.39 million tweets across Germany, Italy, Spain, the United Kingdom and the United States during the early stages of the COVID-19 pandemic (1 December 2019–30 April 2020). Results show a consistent pattern of moderate negative sentiments across all five countries. Although tweets related to immigration and COVID-19 increased, negative public sentiment towards migrants did not appear to increase significantly, as it was balanced out by tweets conveying positive sentiments. Shifts in sentiment occurred, but changes were temporary. Spain stood out as the country with the largest daily negative sentiment scores, which were associated with a discussion around the topic of "racism and xenophobia".

This research underscores the dynamic and responsive nature of Twitter users and the capacity of tweets with negative sentiment content to generate immediate positive sentiment responses and vice versa (Bae and Lee, 2012:2521). Further, the authors highlight that despite the inherent selection bias, Twitter data can serve as a useful resource to measure and monitor migration-related sentiment in real or near real time. Global trends indicate that new microbial threats will continue to emerge at an accelerating rate (Jones et al., 2008), and stigmatization can be triggered

by not only pandemics (Link and Phelan, 2006) but also other socioeconomic or political shocks. Developing effective strategies for contrasting the spread of stigmatization is challenging due to the unpredictability and rapid geographic proliferation of these events. Traditional sources of information on public attitudes are expensive and hard to collect in emergency settings, especially public health crises.

The analysis also provides evidence of social polarization concerning migration, showing a relatively high concentration of strongly positive and strongly negative sentiments across the five countries considered. Neutral and moderately positive or negative sentiment tweets were less prominent. Social media is likely to exacerbate polarization of opinions at the local, national and global levels, as a result of the creation of so-called echo chambers on these platforms – whether due to the algorithms underpinning content selection for individuals, or personal preferences in accounts followed or the content one engages with. These echo chambers are likely to reinforce pre-existing beliefs by restricting exposure to opposing views (Bail et al., 2018). Understanding social media networks is therefore key to determine how misinformation about migration or xenophobic narratives spread.

The report also shows that if handled rigorously and responsibly, Twitter data can contribute to expanding our knowledge of the misconceptions and contact networks underpinning the formation of attitudes towards immigration, especially if used as a complement to traditional data sources. Successfully integrating data from various sources – traditional and nontraditional – will be a key challenge to address important data gaps on migration moving forward. Facilitating access to and handling of Twitter data would contribute to a more granular and timely understanding of public attitudes towards migration in certain contexts. The announcement by Twitter in January 2021 to make the "full history of public conversation" (Tornes and Trujillo, 2021) freely available for academic research is an encouraging sign in this direction. How to address the inherent selection bias of Twitter and social media data more generally for the analysis of migration-related issues should also take priority in future research. Alongside privacy and ethical responsibility, robust methodologies to correct the selection bias are necessary to make these data actionable for public policy and programmes.

Developing analytical frameworks to monitor immigration sentiment and appropriately inform policy interventions for when and where racist and xenophobic incidents begin to systematically occur should be a policy priority. It is crucial to develop an analytical system to assess and fact-check information across multiple social media platforms in real time. This system would identify source nodes generating and spreading misinformation and hostile rhetoric directed against migrants. Ultimately, this system would equip governments with precise insights about where discriminatory rhetoric comes from and goes to, which makes it possible to tackle misinformation before it can mobilize xenophobic sentiments in the physical and digital world.

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APPENDICES

Appendix 1

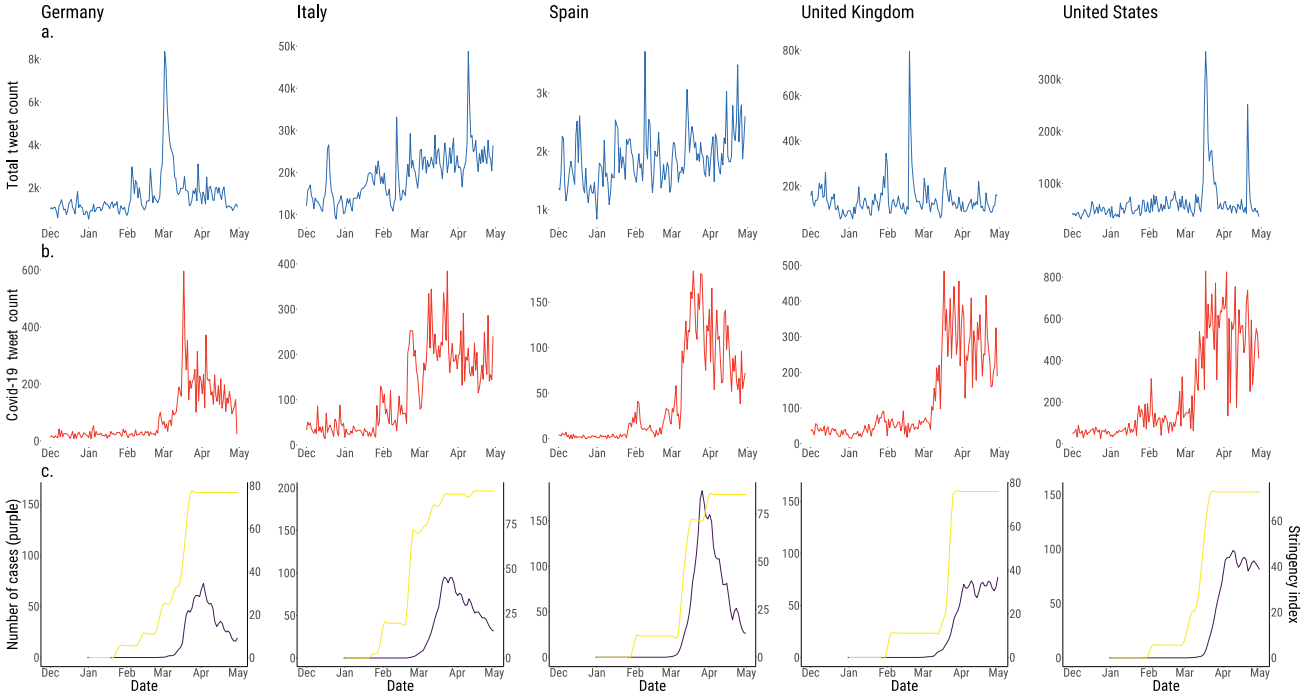
This list of words and hashtags represents the search terms we used to collect the Twitter data, including keywords, hashtags and Twitter user accounts. Our search strategy was guided by the Campbell policies and guidelines for conducting systematic reviews to collect relevant tweets focusing on migration (Campbell Collaboration, n.d.). We developed these terms in consultation with experts within IOM and at the University of Liverpool. We didn't include media outlet accounts as they were likely to add too much noise to the data set next to the occurring migration-related events, but we were still able to capture relevant content of media outlets via discussions of Twitter users. Twitter accounts are not displayed for privacy and confidentiality purposes.

Countries	Categories	Subcategories	Search terms
Germany	Terms		migrant, migranten, migrantin, migrantinnen, migrierende, migration, asylbewerber, asylbewerberin, asylbewerbende, flüchtling, flüchtende, flüchtlinge, “ausländische arbeiter”, “ausländische arbeiterin”, “ausländischer arbeiterinnen”, gastarbeiter, gastarbeiterin, gastarbeiterinnen, “ausländische arbeitskräfte”, “ausländische arbeitskraft”, “illegale arbeiter”, “illegale arbeiterin”, “illegale arbeiterinnen”, “illegal arbeitende”, ausländer, ausländerin, ausländerinnen, zigeuner, zigeunerinnen, “kung flu”, kanacken, kanacke, kanackin, kanackinnen
	Accounts		64
	Hashtags	Positive	#RefugeesWelcome, #MigrantsWelcome, #LeaveNoOneBehind, #FreedomForImmigrants, #BerlinIsOpen, #familyreunion, #wirschaffendas, #TogetherForRescue, #blacklivesmatter, #RescueFamily, #FightForSolidarity, #FreeTheShips, #WirHabenPlatz, #SafePassage, #FlattenTheBorders, #NotMyEU, #ShameOnYouEurope
		Neutral	#migration, #immigration, #immigrant, #migrant, #flüchtling, #flüchtlinge, #Asylrecht, #EUmigration, #Seenotrettung, #Migrationspakt, #MigrationPact, #Migrationspaket, #Rückführungspatenschaft, #Asylreform
		Negative	#illegale, #ausländer, #Zigeuner, #KungFlu, #whitelivesmatter, #Kanacken, #MGGA, #Europistan, #Germanystan, #PEGIDA, #Zukunftheimat, #EinProzent, #ausländerraus, #keepthemout, #unserland, #migrantsnotwelcome, #refugeesunwelcome, #refugeesnotwelcome, #chinaflu, #chinavirus, #alleabschieben, #abschieben, #gegenmigration, #Befreiungvomislam
		Event	#Moria, #flüchtlingscamps, #campschliessung, #MoriaStory, #dreizehntausend, #Iuventa, #SeaWatch3, #Libyen, #RefugeesGR
Italy	Terms		immigrato, immigrati, “richiedente asilo”, “richiedenti asilo”, “persona irregolare”, “persone irregolari”, migrante, migranti, straniero, stranieri, rifugiato, rifugiati, “vittima di tratta”, “vittime di tratta”, “minore non accompagnato”, “minori non accompagnati”, “traffico di migranti”, sbarco, sbarchi, clandestino, clandestini, illegale, illegali, profugo, profughi, “immigrato abusivo”, “immigrati abusivi”, invasione, zingaro, zingari, negro, negri, negre, sporco, sporchi, scimmia, scimmie, extracomunitario, extracomunitari
	Accounts		59
	Hashtags	Positive	#portiaperti, #apriamoiporti, #aprireiporti, #accoglienza, #bastarazzismo, #fatelientrare, #SeaWatch, #SeaEye, #Openarms, #TuttiFratelli, #3ottobre, #restiamoumani, #regolarizzazione, #corridoiumanitari, #solidarieta, #dirittodiasilo, #ioaccolgo
		Neutral	#DecretiSicurezza, #decretoimmigrazione, #migranti, #migrazioni, #immigrati, #immigrazione, #SAR, #searchandrescue, #stranieri, #richiedentiasilo, #asilo, #rifugiati, #integrazione, #ONG, #iussoli, #decretiSalvini, #razzismo, #cittadinanza, #MareNostrum, #reinsediamento, #rimpatri, #Mediterraneo, #RegolamentoDublino, #hotspot, #tratta
		Negative	#portichiusi, #tolleranzazero, #descretisicurezza, #decretosalvini, #decretoimmigrazione, #BloccoNavale, #blocconavalesubito, #chiudiamoiporti, #invasione, #lamorgesedimettiti, #extracomunitari, #clandestini, #profughi, #irregolari, #ItaliaAgliItaliani, #aiutiamoliacasaloro, #primagliitaliani, #Decretoclandestini, #DifendiamolItalia, #iostoconSalvini
		Event	#Moria, #Etienne, #Abou, #Lesbo, #WillyMonteroDuarte, #WillyMonteiro

Countries	Categories	Subcategories	Search terms
Spain	Terms		migraci, migrante, refugiad, migratorio, refugiada, discrimin, extranjer, xenofo, racista, deporta, legal, patriota, racismo, invasores, musulman, islamofobia, marroquí
	Accounts		36
	Hashtags	Positive	#InmigracionNoInvasion, #nomasdiscriminacion, #conlosrefugiados, #nohayserhumanoilegal, #multicultural, #bienvenidosaespana, #enddeportaciones
		Neutral	#Extranjería, #Inmigración, #Nacionalidad, #inmigrantes, #migrantes, #migración, #todossomosmigrante, #redmigrante, #migraciónlaboral, #leydemigración, #leydemigraciones, #migracionysalud, #migracionyeducacion, #migracionytrabajo, #migracionyeconomia, #soymigrante, #soymigranteandalucia
		Negative	#leymigratoriaya, #Quelosdeportenatodos, #DeportacionYa, #fueramigrantes, #cierrenfronteras, #NoMasMigrantes, #DeportacionInmediata, #inmigrantesilegales, #nomasinmigrantes, #TrataDePersonas, #TráficollícitodeMigrantes
		Event	#siria, #MoriaCamp, #lesbos
United Kingdom	Terms		immigrant, immigration, migrant, migration, “asylum seeker”, refugee, “undocumented worker”, “guest worker”, “EU worker”, “non-UK workers”, “foreign worker”, (human smuggling), (human trafficking), illegals, foreigner, “illegal alien”, “illegal worker”, islamophob*, sinophob*, “china flu”, “kung flu”, “china virus”, “chinese virus”, shangainese
	Accounts		37
	Hashtags	Positive	#RefugeesWelcome, #MigrantsWelcome, #LeaveNoOneBehind, #FreedomForImmigrants, #illegalmigrantsUK, #LondonIsOpen, #EndHostileEnvironment, #FamiliesBelongTogether
		Neutral	#Pritiuseless, #migrationEU, #immigration, #migration, #immigrant, #migrant, #immigrate, #migrate, #refugees, #NigelFarage, #ImmigrationReform
		Negative	#illegals, #foreigner, #foreigners, #illegalalien, #illegalaliens, #illegalworker, #OurCountry, #illegalworkers, #KeepThemOut, #SendThemBack, #migrantsnotwelcome, #refugeesnotwelcome, #illegals, #ChinaVirus, #chinaflu, #kungflu, #chinesevirus, #TheyHaveToGoBack, #DeportThemAll
		Event	#Moria, #CampFire, #closethecamps
United States	Terms		immigrant, immigration, migrant, migration, “asylum seeker”, refugee, “undocumented worker”, “guest worker”, “foreign worker”, (human smuggling), (human trafficking), illegals, foreigner, “illegal alien”, “illegal worker”, islamophob, sinophob, “china flu”, “kung flu”, “china virus”, “chinese virus”, shangainese
	Accounts		37
	Hashtags	Positive	#RefugeesWelcome, #MigrantsWelcome, #LeaveNoOneBehind, #FreedomForImmigrants, #illegalmigrantsUSA, #KillTheImmigrationBill, #ImmigrantsMakeAmericaGreat, #NoWall, #NoWallEver, #NoBan, #FamiliesBelongTogether, #stopICEcold, #EndRemainInMexico
		Neutral	#ICE, #immigration, #migration, #immigrant, #migrant, #immigrate, #migrate, #refugees, #ImmigrationReform
		Negative	#illegals, #foreigner, #foreigners, #illegalalien, #illegalaliens, #illegalworker, #illegalworkers, #KeepThemOut, #OurCountry, #SendThemBack, #migrantsnotwelcome, #refugeesnotwelcome, #illegals, #ChinaVirus, #chinaflu, #kungflu, #chinesevirus, #TheyHaveToGoBack, #DeportThemAll
		Event	#Moria, #closethecamps, #divestfromdetention

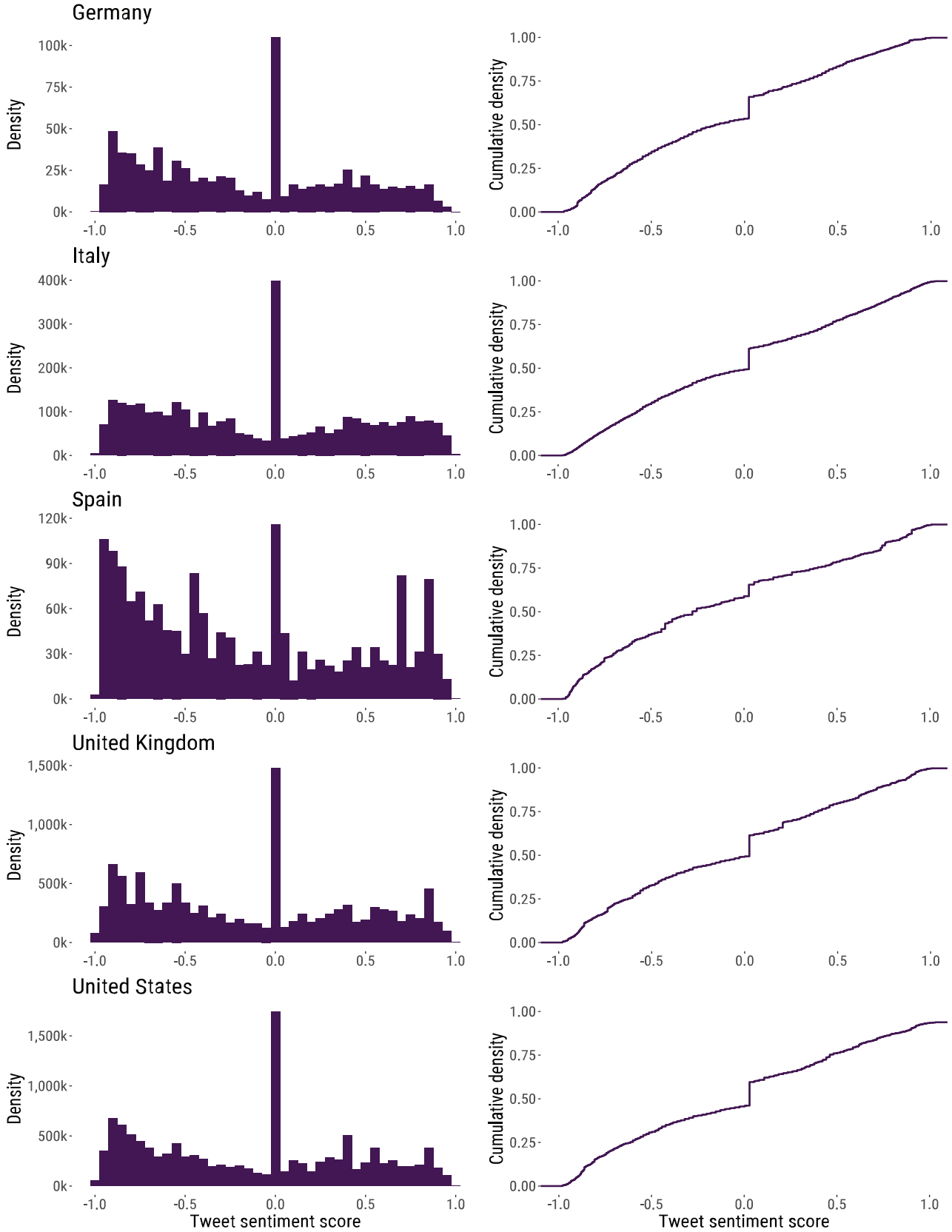
Appendix 2

(a) Number of daily immigration-related tweets and (b) immigration- and COVID-related tweets. (c) Number of cases (purple line) refers to the number of new COVID-19 cases per million. The stringency index (yellow line) measures the level of non-pharmaceutical government interventions for COVID-19, such as social distancing and lockdown measures (100 indicates the strictest).



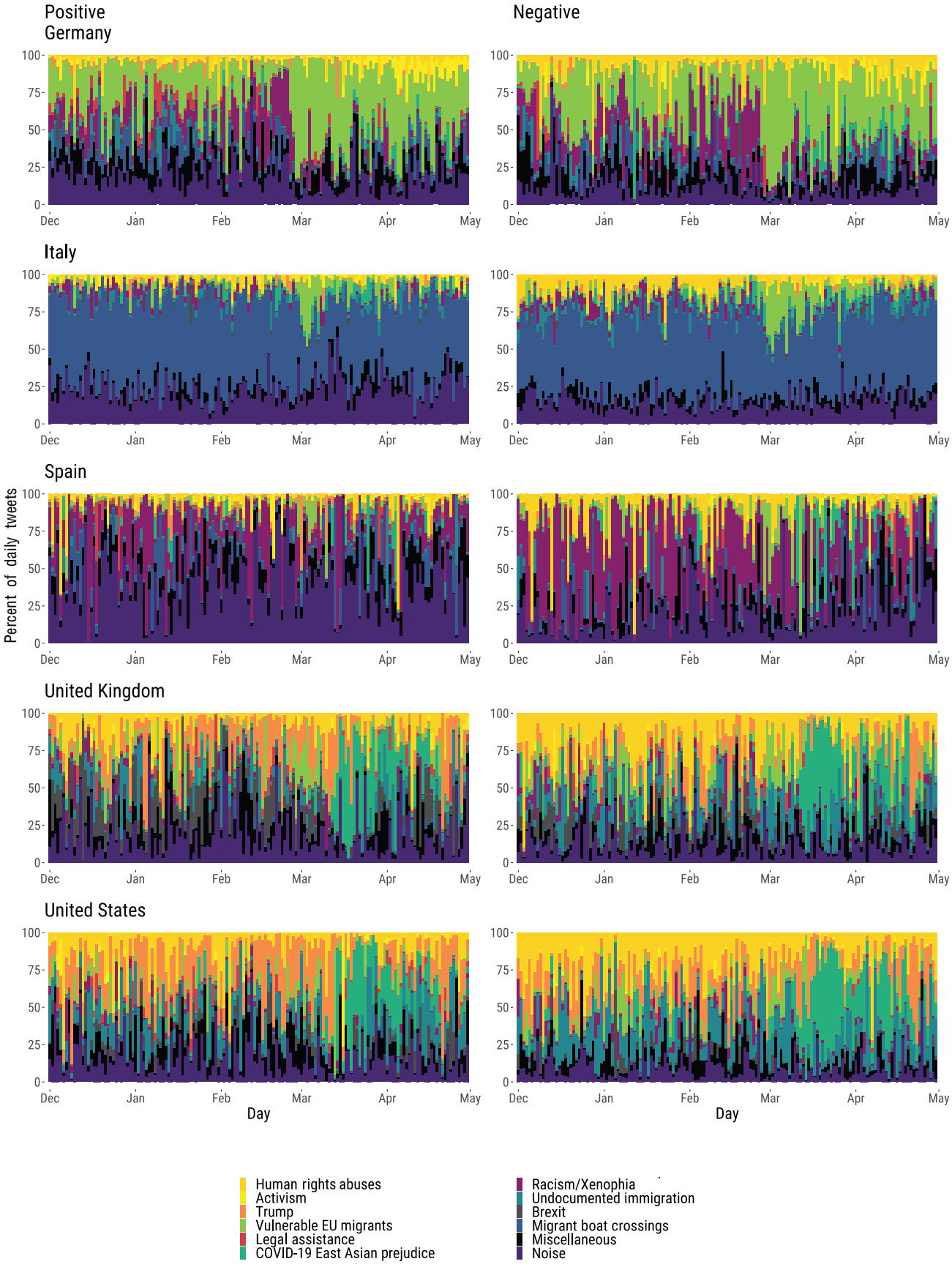
Appendix 3

Density (left) and cumulative (right) distribution of sentiment scores.



Appendix 4

Breakdown of Figure 2 by the composition of positive and negative sentiment scores.



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