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The lived experience of people with disabilities during the COVID-19 pandemic on Twitter: Content analysis

Marlon I. Diaz[1,2], Richard J. Medford[1], Christoph U. Lehmann[1] and Carolyn Petersen[3]

Abstract

Objective: People with disabilities (PWDs) are at greater risk of COVID-19 infection, complications, and death, and experience more difficulty accessing care. We analyzed Twitter tweets to identify important topics and investigate health policies' effects on PWDs.

Methods: Twitter's application programming interface was used to access its public COVID-19 stream. English-language tweets from January 2020 to January 2022 containing a combination of keywords related to COVID-19, disability, discrimination, and inequity were collected and refined to exclude duplicates, replies, and retweets. The remaining tweets were analyzed for user demographics, content, and long-term availability.

Results: The collection yielded 94,814 tweets from 43,296 accounts. During the observation period, 1068 (2.5%) accounts were suspended and 1088 (2.5%) accounts were deleted. Account suspension and deletion among verified users tweeting about COVID-19 and disability were 0.13% and 0.3%, respectively. Emotions were similar among active, suspended, and deleted users, with general negative and positive emotions most common followed by sadness, trust, anticipation, and anger. The overall average sentiment for the tweets was negative. Ten of the 12 topics identified (96.8%) related to pandemic effects on PWDs; "politics that rejects and leaves the disabled, elderly, and children behind" (48.3%) and "efforts to support PWDs in the COVID crisis" (31.8%) were most common. The sample of tweets by organizations (43.9%) was higher for this topic than for other COVID-19-related topics the authors have investigated.

Conclusions: The primary discussion addressed how pandemic politics and policies disadvantage PWDs, older adults, and children, and secondarily expressed support for these populations. The increased level of Twitter use by organizations suggests a higher level of organization and advocacy within the disability community than in other groups. Twitter may facilitate recognition of increased harm to or discrimination against specific populations such as people living with disability during national health events.

Keywords

COVID-19, social media, Twitter, sentiment analysis, disability, health disparity, health inequity, discrimination, crisis standard of care

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[1]Clinical Informatics Center, UT Southwestern Medical Center, Dallas, TX, USA
[2]Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center, El Paso, TX, USA
[3]Department of Artificial Intelligence and Informatics, Mayo Clinic, Rochester, MN, USA

Corresponding author:
Carolyn Petersen, Department of Artificial Intelligence and Informatics, Mayo Clinic, 200 First St. SW, Rochester, MN, 55905, USA.
Email: petersen.carolyn@mayo.edu

Introduction

The COVID-19 pandemic disrupted health care systems worldwide. Two years after the start of the global pandemic, the World Health Organization reported more than 452 million cases and 6 million deaths from COVID-19 worldwide on March 11, 2022.[1] At that time, the virus accounted for a reported 78.7 million cases and 957,00 deaths in the USA, 3.34 million cases and 37,000 deaths in Canada, and 19.4 million cases and 162,000 deaths in the UK.[1] Forty-three percent of individuals who acquired COVID-19 experienced or are experiencing postacute sequelae of COVID-19 (PASC) or "long COVID."[2] For patients who were or were not hospitalized due to COVID-19, the estimates were 54% and 34%, respectively.[3] The COVID-19 pandemic left health care systems overwhelmed and unable to care for the rapidly growing number of patients resulting in capacity measures such as cancelling elective surgeries and nonurgent care. When these measures were insufficient, providers and organizations were forced to choose which patients to treat preferentially or to deny care.[4]

In emergency situations, crisis standards of care (CSC) may be used to determine how to allocate and ration limited resources[5] by assigning patients CSC scores using acute and chronic severity of illness and life expectancy. Even though scores are supposed to lead to unbiased decisions, CSC priority scores result in fewer scarce resources allocated to Black patients.[6] Evidence is emerging that CSC may disproportionately affect disadvantaged populations because comorbid conditions and expected lifespan are unequally distributed.[7] Health service researchers have proposed alternate ways of distributing resources that seek to avoid discrimination against people with severe health conditions.[8] Section 1557 of the United States Affordable Care Act and Section 504 of the Rehabilitation Act prohibit discrimination based on disability in programs and activities funded by the federal Department of Health and Human Services.[9] During the COVID-19 pandemic, some health care organizations and providers were accused of failure to comply, with disability advocacy organizations in several states filing complaints with the Office of Civil Rights.[10–14]

Existing CSC recommendations support the development of CSC plans that embody fairness and equitable processes, including transparency, consistency, proportionality, and accountability. Furthermore, they call for community and provider engagement, education, and communication, and the rule of law with regard to authority and environment.[15] However, even when CSC are implemented in accordance with antidiscrimination mandates, access to care, the services of caregivers, and other resources may be limited, leading to decline in health and quality of life, disparities, and health inequities.[6,16–19] An analysis of US ventilator allocation guidelines and CSC guidance for ventilator reallocation indicates that inequities may result from the use of such guidelines[18,20] when community attitudes do not support ventilator reallocation.[21]

Adding to the effects of CSC, having any disability negatively affects the likelihood, severity, and outcome of COVID-19 infection. Heightened vulnerability results not only from disease- and disability-related characteristics such as reduced lung function but also from environmental factors such as living in a congregate setting (e.g. long-term care facility) or lack of access to protective equipment.[22–24] Disability often may result in a lower economic status and decreased access to care, medical products, and services (e.g. face masks and home grocery delivery).[25] COVID-19 screening and practices are variable and may not be performed in ways that are effective in some people (e.g. those with spinal cord injuries),[26] and test kits may not be available to people with disabilities (PWDs).[27] In addition, COVID-19 may present differently in PWDs, hampering timely diagnosis.[28,29] Reduced activity due to self-isolation or home lockdown may increase pain, make pain management strategies less effective, or increase the likelihood of health problems associated with lack of exercise.[30,31]

Social media[32] has been shown to be a valid approach to identifying patient perspective around health conditions, pandemics, preventive measures, and treatments.[33–35] The microblogging platform Twitter facilitates analysis of public perceptions and patient perspectives. More than 145 million daily active users[36] post, repost, and comment on "tweets"—short notes of up to 280 characters. Twitter commentary has been used as a reflection of public opinion on health conditions such as diabetes[37] and cancer and on legislation (e.g. the Affordable Care Act).[38] Twitter has acted as a tool for analysis of public opinion and sentiment on emerging infectious disease outbreaks such as measles,[39] influenza,[40] Zika,[41] Mpox,[42] and SARS-CoV-2.[34,35] We hypothesized that the public discussion on Twitter would provide insight into the experience of PWDs during the COVID pandemic.

Methods

Data collection and processing

On 14 January 2022, we used Twitter's application programming interface (API) to access Twitter's public COVID-19 stream.[43] We collected all English-language tweets for a 2-year span from 1 January 2020 to 14 January 2022. The tweets contained a combination of keywords related to COVID-19, the disability community, and topics of discrimination and inequity such as "Krip the vote," "Disability Twitter," and "Eugenics by CDC" (Appendix). We provided descriptive statistics for tweets, including user profiles and tweet content, and determined long-term tweet availability based on Twitter API status codes ("user suspended" or "no user found with this User ID"). We used Python version 3.9.1 software (Python

Table 1. Characteristics of Twitter users.

	All Users		Active Users		Suspended Users		Deleted Users	
	$n = 43,296$		$n = 41,140$		$n = 1068$		$N = 1088$	
User characteristics								
Verified Twitter account	3026		3013		4		9	
User followers	16,395		17,119		3886		1300	
User posts to date	30,967		31,041		43,839		13,001	
Demographic **characteristics**	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)
Age group								
≤18	4941	11.4	4567[a,b]	11.1	175[c]	16.4	199	18.3
19–29	3996	9.3	3702[a,b]	9.0	131[c]	12.3	163	15.0
30–39	11,854	27.3	11,231[b]	27.3	301	28.2	322	29.6
≥40	22,505	52.0	21,640[a,b]	52.6	461[c]	43.1	404	37.1
Gender								
Male	22,879	52.8	21,599[a,b]	52.5	670[c]	62.7	610	56.1
Female	20,418	47.2	19,542[a,b]	47.5	398[c]	37.3	478	43.9
Ethnicity								
Asian	4786	11.1	4484[d]	10.9	166[e]	15.6	136	12.5
Hispanic	3668	8.4	3497[a]	8.5	79	7.4	92	8.5

(continued)

Table 1. Continued.

	All Users		Active Users		Suspended Users		Deleted Users	
	$n = 43,296$		$n = 41,140$		$n = 1068$		$N = 1088$	
Non-Hispanic Black	7414	17.2	7035	17.1	183	17.1	197	18.1
Non-Hispanic White	27,427	63.3	26,124[a,f]	63.5	640	59.9	663	60.9
Type of account								
Organization	19,027	43.9	18,307[a,b]	44.5	374[g]	35.0	346	31.8
Personal	24,269	56.1	22,833[a,b]	55.5	694[g]	65.0	742	68.2

Comparison between the groups is done using the Welch *t*-test.
[a]Significant difference between active and suspended users ($P < 0.001$).
[b]Significant difference between active and deleted users ($P < 0.001$).
[c]Significant difference between suspended and deleted users ($P < 0.032$).
[d]Significant difference between active and suspended users ($P < 0.01$).
[e]Significant difference between suspended and deleted users ($P < 0.010$).
[f]Significant difference between active and deleted users ($P < 0.02$).
[g]Significant difference between suspended and deleted users ($P < 0.017$).

Table 2. Characteristics of tweets.

	All Tweets		Active		Suspended Tweets		Deleted Tweets	
Tweets	$n = 94{,}814$		$n = 90{,}500$		$n = 2585$		$n = 1729$	
Users	$n = 43{,}296$		$n = 41{,}140$		$n = 1068$		$n = 1088$	
Characteristics	*N*	(%)	*N*	(%)	*N*	(%)	*N*	(%)
Has reply	10,782	11.4	10,439[a,b]	11.5	209	8.1	134	7.8
Has like	25,611	27.0	24,741[a,b]	27.3	559[c]	21.6	311	18.0
Has retweet	28,861	30.4	27,623[a,b]	30.5	884[d]	34.2	354	20.5
Has been quoted	8673	9.1	8429[a,b]	9.3	158	6.1	86	5.0
Twitter source								
Twitter Web App	33,682	35.5	32,341[a]	35.7	757[d]	29.3	584	33.8
Twitter for iPhone	22,780	24.0	21,226[a,b]	23.5	1014[e]	39.1	540	31.2
Twitter for Android	18,058	19.0	16,967[a,b]	18.7	632	24.4	459	26.5
Hootsuite Inc.	3811	4.0	3792[a,b]	4.2	4[d]	0.01	15	0.1
TweetDeck	2553	2.7	2528[a,b]	2.8	18	0.7	7	0.4

Comparison between the groups is done using chi-square test.
[a]Significant difference between active and suspended users ($P < 0.001$).
[b]Significant difference between active and deleted users ($P < 0.001$).
[c]Significant difference between suspended and deleted users ($P < 0.003$).
[d]Significant difference between suspended and deleted users ($P < 0.001$).
[e]Significant difference between suspended and deleted users ($P < 0.002$).

Software Foundation, Wilmington, DE) for all data processing and analyses.[44] Institutional review board approval and informed consent were not required because this study used only publicly available data published voluntarily by Twitter users.

Descriptive analysis

We used the python library M3-Inference,[45] which uses a deep learning model trained on a Twitter data set using profile images, screen names, names, and profile descriptions to predict the Twitter users' gender, age, and type of account. We used the ethnicolr library[46] in Python to obtain ethnicity information, which uses a model trained off the 2010 US census data to predict the user's ethnicity.

Sentiment and emotion analysis

Prior to performing a sentiment analysis on the tweets, we preprocessed the tweets into plain text, which required the removal of hyperlinks, Twitter handles, "#" symbols, and replies to tweets. We used Python's SentiStrength Library[47] to identify and classify these preprocessed tweets' sentiment (positive or negative). SentiStrength uses a lexicon-based classifier as well as a rule-based algorithm to measure sentiment on a scale of −4 (most negative) to 4 (most positive). Because deleted or suspended accounts may represent individual accounts that ran afoul of the Twitter rules of engagement, we calculated the average monthly sentiment for all the tweets and compared them based on their account status (active, suspended, or deleted). Before performing an emotion analysis on the tweets, we use the Spacy library[48] to clean the text further. We tokenized and transformed the tokens into their root form through natural language processing techniques such as lemmatizing and removing stop words and nonalphanumeric characters. The removal of stop words eliminates words that provide little semantic meaning, such as "their," "who," and "is." We used the Python library NRCLex[49] to label the primary emotion for each tweet (fear, anger, anticipation, trust, surprise, sadness, disgust, or joy).

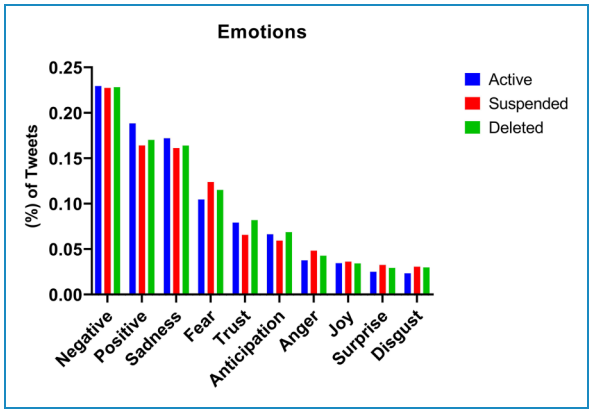

Figure 1. Emotion analysis for active, suspended, and deleted accounts.

Topic modeling

Topic modeling is an effective methodology for organizing large amounts of unstructured social media data (like a library of tweets) into topics. Conventional methods, such as content analysis, rely on human coders to identify topics, but these can be slow and unreliable. In contrast, topic modeling uses machine learning algorithms, such as latent Dirichlet allocation (LDA), to automatically analyze textual data and identify topics. This approach is especially valuable during fast-moving events, such as pandemics, when timely understanding of public sentiment and timely responses from public health agencies are critical.[50]

To clean the data by removing tweets unrelated to COVID-19 and disabilities, we used the gensim[51] library in Python and applied an unsupervised machine learning algorithm called LDA[52] to group tweets using a representative set of words into word clusters. We then used the most highly weighted words in each cluster to determine the content of each topic. We removed tweets with topics unrelated to COVID-19 and inequities in the disabled community. With the remaining tweets, we then performed an additional topic modeling and analyzed topics by word clusters to determine the content of each topic. Topic modeling allows the discovery of themes or patterns in a corpus. A pattern describes a set of recurring words that suggest a topic of discussion that reoccurs in multiple tweets.

To optimize the number of topics in our analysis, we trained and evaluated several LDA models with topics ranging from 2 to 50 topics based on their topic coherence score, which summarizes the semantic similarity among high scoring (frequent) words within topics. We ultimately chose a 12-topic LDA model as it produced the highest score. An author without access or insight into the topic modeling labeled the topics using the 20 most frequently used terms, which were ranked by weight. All authors evaluated these topic labels, reached a consensus, and identified example tweets whose content pertained >99% to a specific topic.

Results

Descriptive analysis

Between 1 January 2020 and 14 January 2022, we identified 134,443 English-only tweets related to COVID-19, the disabled community, and topics of discrimination and inequality among the disabled community. After the removal of duplicate tweets, tweets that were replies, and retweets, we retained 94,814 tweets from 43,296 accounts. Of all accounts, 1068 were suspended during our observation period (2.5%) and 1088 (2.5%) were deleted (Table 1) while 41,139 (95%) remained active Twitter accounts. Among verified users tweeting about COVID-19 and disability, suspension (0.13%) or account deletion (0.3%) was significantly less common ($p < 0.001$).

Table 1 shows the demographics of Twitter users, including age, gender, and ethnicity. The largest group of users included users 40 years or older (52%). Compared to other topics our group had explored regarding COVID-19, this percentage was higher (Plandemic/Scamdemic 45% and Breastfeeding (manuscript in preparation) 33%).[53] Males and non-Hispanic Whites represented the largest groups of all user groups (Table 1). Male users under the age of 40 were overrepresented significantly among accounts that had been suspended or deleted. Asian users were significantly overrepresented in suspended accounts compared to active accounts (15.6% vs. 10.9%, $p < 0.001$), whereas Hispanic users were significantly underrepresented among suspended accounts (7.4% vs. 8.5%, $p < 0.001$). The vast majority of suspended and deleted users tweeted from personal accounts, 65.0% and 68.2%, respectively. Suspended users, on average, posted more than active users and had fewer followers than active users.

Of all 94,814 tweets, 90,500 (95.5%) tweets were published by 41,140 (95.0%) active users (2.2 tweets per user), 2585 (2.7%) tweets were published by 1068 (2.5%) subsequently suspended users (2.4 tweets per user), and 1729 (1.8%) of tweets were published by 1088 (2.5%) user accounts subsequently deleted (1.6 tweets per user) (Table 2).

Users who were suspended were statistically more likely to have their tweets retweeted ($p < 0.001$) compared to active users. Twitter Web App was the most used platform by active users (35.5%). Users who were suspended were statistically more likely to be iPhone users (39.1%) compared to active (23.5%) and deleted users (31.2%). Tweets posted by active users were statistically more likely to contain replies, likes, and be quoted by other Twitter users ($p < 0.001$).

Our analysis explores whether accounts belong to individuals versus organizations. With 43.9%, the percentage of organizational accounts was higher for the disability topic than any other COVID-19-related topic that we reviewed in the past.

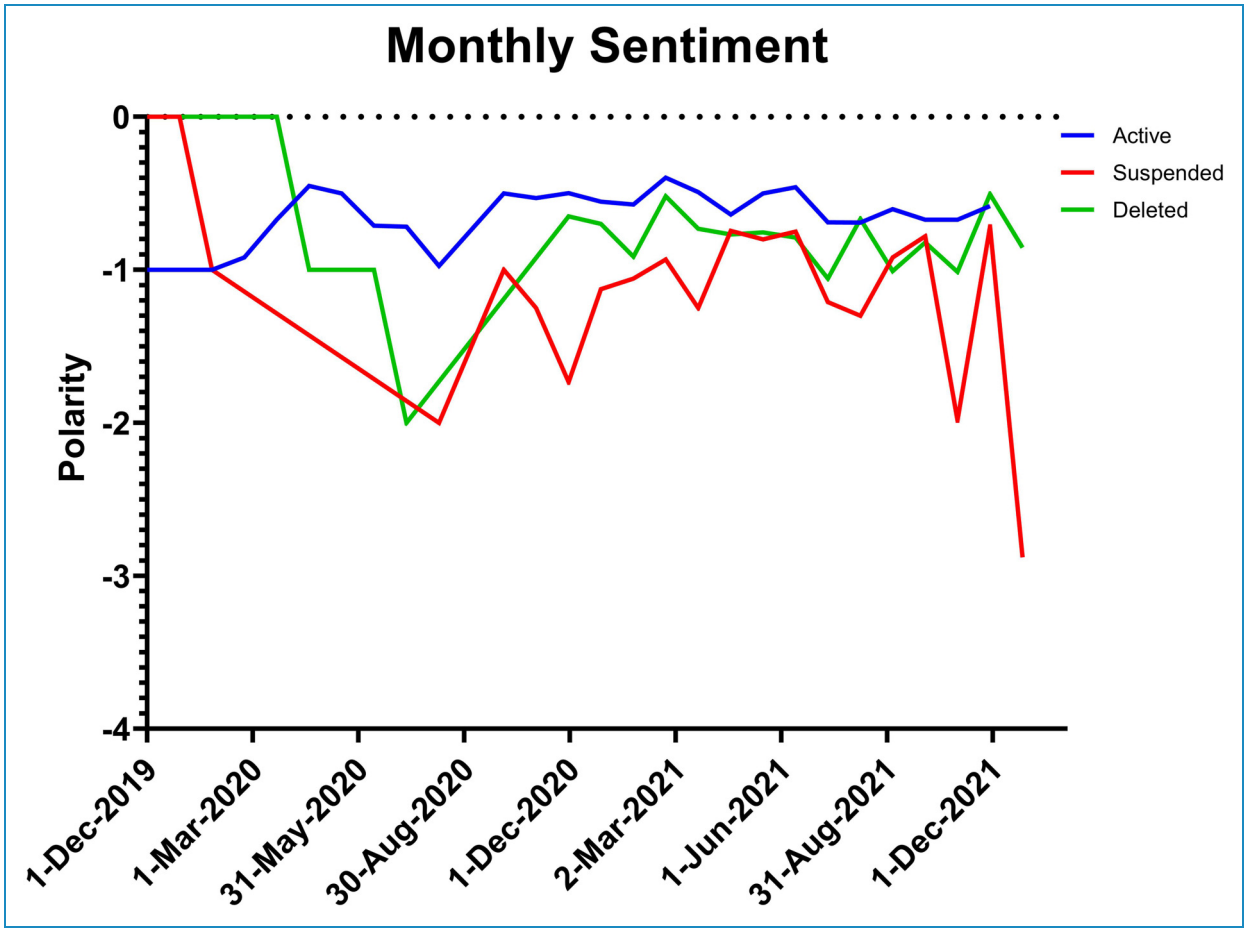

Figure 2. Sentiment analysis (scales −4 to 4). Suspended accounts generated tweets that were more negative.

Emotion analysis

Emotions were similarly distributed among active, suspended, and deleted users. Generalized negative and positive emotions were most common followed by sadness, trust, anticipation, and anger for all tweet groups (Figure 1). Tweets from suspended accounts were more likely to express fear than tweets from active and deleted accounts.

Sentiment analysis

The overall average sentiment for the tweets on a scale from −4 (most negative) to 4 (most positive) was negative, as shown in Figure 2. The degree of negative sentiment varied among the groups, with tweets from active users being less negative than those posted by suspended and deleted users. Throughout the study period, suspended tweets contained the most negative sentiment out of all the groups.

Topic models

The LDA model identified 12 topics expressed in our sample of tweets. The topics were labeled subjectively based on their respective keywords (Table 3). Two topics (representing only 3.2% of all tweets) were not per se related to PWD. One topic (1.4%) discussed the disinformation relating to how the vaccine "can disable" a person and the other (1.8%) focused on the disability resulting from long COVID. The remaining 10 topics (96.8%) were focused on the effects of the pandemic on PWD. Nearly half of the tweets belonged to the topic "Politics that neglect and leave behind PWD, older adults, and children" (48.3%). The next most popular topic was "Efforts to support PWD in the COVID-19 crisis" (31.8%). The third most common topic, "Disabled people need better access to vaccines and other support," accounted for only 6.3% of tweets. Analysis of sentiment strength, mean retweets, and mean likes (Table 4) indicated that the most negative sentiments (calls for political action to protect PWD from COVID-19 and politics that neglect and leave behind PWD, older adults, and children) did not necessarily receive the largest numbers of retweets and likes.

Discussion

Our research on early COVID-related Twitter data, which predates even the coining of the term "COVID," uncovered

Table 3. Table of topic models.

Topic	Tweets/ Topic, *n* (%)	Keywords	Representative Tweet
1. Anger over antivaxxers	1186 (1.3)	covid, disability, student, vaccine, new, year, home_community, disability_barrier_aodaalliance, onpoli_crpd_accessiblecanada, year_uphill_battle_unprecedented, end_report_accessibility_aoda, people, coronavirus, disabled, impaired, study, impairment, shortage_carehome_disabled, sars, metropolitanpolice_riotpolice	You're congratulating a man who was complicit in the deaths of over 80 Samoans, mostly kids, and the sickness/disability of 6000 more, because he persuaded them to avoid vaccination against measles. He only escaped jail on a technicality. #AntiVaxKills #AntiVax is #ChildAbuse
2. Discussing how vaccines can disable you (vaccine complications)	1374 (1.4)	covid, vaccine, cognitive_impairment, disability, symptom, patient, people, new, vaccination, disabled, city, brain_fog, impairment, information, day_christmas_pls_sign, petition_help_carers_shortage, carehome_disabled_home_community, activity, learn, long_covid	@OllyOllyInFree #StopTheEXPERIMENT no one is liable if you are disabled or killed using the experimental transfection agent disguised as corona ðŸ'‰,they skipped animal trials so you're the lab rat that may experience fatal immune enhancement reaction https://t.co/wrB6J1cpVN
3. Masks protect disabled kids, antimask rules disproportionately affect them	871 (0.9)	covid, disability, people, vaccine, school_mask, sign_support, life_threaten, mask_school_protect, prophesy_coronavirus_december_ravaging, locusts_plague_live_jesus, law_attorney_lawyer, law_news_disabilitylaw_news, lord_acripplehaswalked, instagram, long_covid, disabled, coronavirus, kid, chronlaw_disability, death_permanent	Federal judge rules Texas school mask ban violates Americans with Disabilities Act. #ChicagoPd #AEWDynamite #MAFS #CMAawards #MarriedAtFirstSight #SistasOnBET #COVID19 https://t.co/ZkdpZmRlsI
4. PWDs are affected more through worse outcomes and discrimination	3119 (3.3)	people, disability, covid, disabled, coronavirus, learn, pandemic, england, patient_learn, family, intellectual_disability, support, life_save, time_likely_die, need, lockdown, facebook, fury_resuscitate_notice_give, vaccine, onpoli_crpd	@kidneyontario @ottawadonors @UHNTransplant @CanadasLifeline News release: The Danger of flagrant disability discrimination in access to life-saving critical care grows as overloaded Ontario hospitals near breaking Point https://t.co/nEFf75lstc #accessibility #AODAfail #COVID19 #triage #onpoli #CRPD
5. CSC–crisis standards of care–and the fear that they will be used to withhold/ deny care to PWD.	935 (1.0)	covid, disability, disabled, people, woman, vaccine, healthcare_oakgar_oakgarrecruitment_carehome, healthandsocialcare_socialcare, learningdisabilitie_elderly_dementia_supportedlive, mentalhealth, highriskct, age_base, aoda_accessibility, disabilities_remain_live_worry, vaccination, year_secret_ontario_critical, hospitals_threat_discrimination_patient, care_triage_protocol_send, danger, home_community_care_pls	@POTUS @GovNedLamont @CDCgov @NatCounDis @DrNunezSmith Connecticut has no procedure for disabled residents with CDC-listed high-risk conditions to request a reasonable exception or modification to their age-based-only COVID vaccine distribution policy. We are last in line. Please help us. #HighRiskCT

(continued)

Table 3. Continued.

Topic	Tweets/ Topic, *n* (%)	Keywords	Representative Tweet
6. PWDs need better access to vaccines and other support	5981 (6.3)	vaccine, disability, people, covid, auspol, vaccination, vaccinate, learning_disability, lose_job, eligible, worker, australia, resident, read, hate_ask_money_know, vaccine_rollout, aged_care, mutual_aid_request_long, term_covid_stephanie, dose	@karamargin, @AZDanielRuiz CDC: States should prioritize people with disabilities as they broaden vaccine access. Listen up AZ! #CovidVaccine #HighRiskAZ, #Disabilityhasnoagerequirement, #ADAaccess, #ADAcompliance
7. Efforts to support PWD in the COVID-19 crisis	30,140 (31.8)	disability, people, covid, pandemic, support, person, impact, learn, need, community, work, help, disabled, new, access, inclusion, today, world, include, live	Last week we organized a consultation with over 15 OPD reps in Indonesia to help @FCDOGovUK refresh its #disability inclusion strategy. Grantees spoke of the challenges persons with disabilities have faced during #COVID19 & how donors can support ongoing efforts led by OPDs. https://t.co/IAV289rt2I
8. Donation and aid to PWD	1236 (1.3)	help, disability, people, covid, vaccine, learn, disabled, easy_read, christmas, support, donate, app, link, vaccination, instagramdisable, need, video, pandemic, check, gofundme	Donated Ration and groceries supplies to the visually impaired families of Gomathipuram, Thiruninravur 5/06/21 #geoindiafoundation #covid19relief #covidindia #ration #charity #communityhelp #chennai #ngo #visuallyimpaired https://t.co/F0iozlkw1e
9. Politics that neglect and leave behind PWD, older adults, and children	45,803 (48.3)	covid, disabled, people, disability, long_covid, vaccine, die, death, need, child, disable, know, get, like, life, go, care, year, time, live	$100 for a rapid #covid test in America over the counter during a pandemic thanks to capitalism & #JenPsaki mocks the idea of sending Americans free covid tests while sick, poor & disabled people wait in lines outside in the cold for hours to get tested America is a failed state
10. Long COVID and the resulting disability	1699 (1.8)	help, long_covid_survivor_financially, need, long_covid, disability, disabled, unable_work_struggle_desperately, disable_yr, fault_help_senatedems_nytime, aoc_ewarren_sensanders_repcori, fellow_hurt_human, tesla_billgates_microsoft_help, one_pandemic_amazon_elonmusk, people, work_forget, income, neisvoid_disability_twitter, covid, cfs, covidisnotover	@MSNBC Please help #LongCovid survivors financially. We are unable to work and struggling desperately. Iâ€™ve been disabled by #COVID19 for 1 yr through no fault of my own. HELP!! ðŸ†˜â€¼ï¸@HouseDemocrats @SenateDems @nytimes @AOC @ewarren @SenSanders @RepCori @PressSec @RepPressley @elonmusk
11. Lack of access and the		covid, disability, vaccine, people, home_community_based_services,	@SenDuckworth Home & Community Based

(continued)

Table 3. Continued.

Topic	Tweets/ Topic, *n* (%)	Keywords	Representative Tweet
need for technology and/ or other solutions that would create access	1131 (1.2)	discrimination_ontario_criticalcare_triageprotocol, publichealth_publicservicefoodsecuritysanitation_disinfection_services, prioritization_coronavirus, vaccinations_elderlythe, disable_homelesspublicservants_critical_mission, blast_disability, new_torontostar_column_davidlepofsky, ford_government_fordnation_secrecy, aoda_onpoli_onhealth_crpd, surround_triage_plan_accessibility, ethiopia, disabled, addisababa, key_include_ppl, disability_community_exacerbate	Services are key to including ppl w/ #disabilities in the community, but #COVID19 exacerbated a long-standing workforce crisis in this field. PIs support $400B proposed by @POTUS for #Medicaid #HCBS in budget bill!
12. Calls for political action to protect PWD from COVID-19	1339 (1.4)	disability_need_real, action_plan_delay_create, hardship_covid_crisis_aoda, people, doug_ford_fordnation_day, accessibility, call_strong_new_action, year_get_hondavidonley_report, covid, action_accessibility_people, report_call_strong_new, disability, help_desperately, financially_disabled_unable_work, forget_one_pandemic_humanitarian, help_covid_longhaulers, month_get_hondavidonley, gaza_strip, zionists_besiege, disability_freepalestine	@TheDuhalde @triofrancos My alma mater, too! #WeSupport students & workers in their calls for protection. #COVID19 is a humanitarian crisis & mass disabling event. @WhiteHouse & @POTUS must do more. Take action with us THURSDAY: https://t.co/InpR8T3rbX

Table 4. Table of topics with sentiment strength, mean retweets, and mean likes.

Topic	Sentiment Strength	Mean Retweets	Mean Likes
1. Anger over antivaxxers	−0.75	1.13	1.99
2. Discussing how vaccines can disable you (vaccine complications)	−0.79	2.94	5.88
3. Masks protect disabled kids, antimask rules disproportionately affect them	−0.48	3.79	6.08
4. PWDs are affected more through worse outcomes and discrimination	−0.83	2.75	3.63
5. CSC (crisis standards of care) and the fear that they will be used to withhold/deny care to PWD	−0.35	1.94	3.81
6. PWDs need better access to vaccines and other support	−0.58	3.26	8.08
7. Efforts to support PWD in the COVID-19 crisis	−0.11	3.25	7.50
8. Donation and aid to PWD	−0.05	3.20	3.90
9. Politics that neglect and leave behind PWD, older adults, and children	−0.95	9.49	29.14
10. Long COVID and the resulting disability	−0.66	1.12	1.93
11. Lack of access and the need for technology and/or other solutions that would create access	−0.66	1.36	1.96
12. Calls for political action to protect PWD from COVID-19	−1.11	0.85	1.26

important themes that had not yet gained widespread public attention. As early as January 2020 (2 months prior to the stock market crash), Twitter users expressed concerns about the pandemic's economic impact.[33,34] Moreover, conversations at that time prioritized respiratory protection measures such as wearing masks and practicing social distancing, even before it was established that COVID-19 primarily spreads through respiratory droplets. Harnessing social media data could enable us to leverage the collective knowledge and insights of the masses to identify emerging issues and potential interventions.

PWDs experience worse outcomes following COVID-19 infection than those without disabilities.[23,54] Any disability is associated with increased risk for in-hospital mortality.[55] People with intellectual and developmental disabilities (IDDs) are at a higher risk for infectious disease-related emergency room visits, hospitalization, and death in hospitals.[56,57] They were admitted to hospital with more severe symptoms (e.g. seizures) than non-IDD individuals, deteriorated more quickly, were younger at death, and experienced more difficulty accessing care teams than those without IDDs.[58,59] PWDs had longer hospital stays, more frequent readmissions within 30 days, and a greater likelihood of severe outcomes including death.[60–62] As the pandemic progressed and health care systems became strained, some PWDs found it more difficult to receive their usual level of care[63] or needed medical supplies.[64]

Our analysis of tweets between 1 January 2020 and 14 January 2022 demonstrated that the most important topic (48.3% of tweets) was a discussion on how politics and policies leave disadvantaged populations like PWD, older adults, and children behind. This immediately linked to a discussion of how to help, aid, and protect these populations (31.8%). This focus on the need for support of PWD reinforces research findings that poorer mental well-being, greater occupational stress, difficulty using digital health tools for support, and having their needs go unacknowledged and unaddressed within the community contribute to COVID-related illness and death.[65]

Sadness and fear were among the highest ranked emotions, and overall, the tweets had a negative sentiment throughout. This finding is not surprising given that PWDs were more likely to experience symptoms of psychological stress (e.g. depression, suicide ideation, and anxiety) and report loneliness than people without a disability.[66–68] These sources of stress included pandemic-related concerns such as inadequate access to health care, as well as nonpandemic issues such as emotional or physical abuse and inadequate food.[67] The poorer health outcomes experienced

within this community, noted previously, have been found to have resulted in part from COVID-19 control measures that failed to adequately address PWD human rights and socioeconomic well-being.[69] Heightened visibility of medical ableism[70,71] and the shortcomings of "one size fits all" approaches to public health planning have renewed decades-long calls for rethinking and restructuring of health care for PWD.[72,73]

In addition, our samples of tweets were more likely to be tweeted by organizations than other topics we have explored in the past. This may reflect a high level of organization and advocacy among the PWD community, as well as a growing movement for disability justice focusing on health care-related institutions and policies. Recent work in this area has advocated for the involvement of PWD in disaster planning to address the needs of PWD better,[74] more accurate data collection about PWD to quantify COVID-19-related disparities better and disparity reduction strategies,[75] engagement with the disability community on the development of informatics-based solutions for health disparity reduction,[76] explicit efforts to identify and eliminate structural ableism within health care including medical rationing,[77] and rethinking of the field of bioethics' reflexive disregard for PWD.[78]

Although fewer accounts were suspended in the analysis of this disability and COVID-19 theme than in a prior study on the hashtags #scamdemic and #plandemic, in which more than 20% of accounts were suspended, still in this work, 2.5% of accounts were suspended and 2.5% deleted after a year, which is a fairly high rate. Further, we found that tweets generally had negative sentiments. These findings suggest that this topic generated passionate discussion or outrage, which is more likely to result in reporting of tweets by other users. Users whose accounts were suspended had the most retweets and the highest negative sentiments throughout the observation period, suggesting inflammatory statements more likely generating interests by other Twitter users. In January 2023, iPhones and Android phones accounted for 55% and 45% of the market, respectively.[79] We noticed a relative increase in suspended users who used iPhones, which may have resulted from greater usability of iPhones for PWDs.[80]

Limitations

Our study has a number of limitations. First, we used existing tools to analyze sentiments and emotion of tweets that are not specific to health care topics, which could have skewed our analysis. Second, because we targeted only tweets in English and are unable to determine precise geographic locations for users, we are limited in making conclusions about specific countries or countries where English is the not the predominant language. Third, our keywords selected 10 topics that were indeed focused on PWDs and COVID-19, but 2 topics were not related to this topic and accounted for 3.2% of all tweets.

Conclusions

Twitter, the microblogging social media platform, hosted a robust and in part passionate (as indicated by suspended and closed accounts) discussion on the topic of disability and COVID-19. The predominant discussion focused on how politics and policies leave disadvantaged populations like PWD, the elderly, and children behind followed by the topic focused on helping these populations. Twitter may be a medium that allows public health officials to detect an increase in discrimination of specific populations like people living with disability in the context of a national crisis.

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ORCID iD: Carolyn Petersen https://orcid.org/0000-0002-2136-1273

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Appendix

Keywords contained in Twitter's public tweet stream:

Crip the Vote
CripTheVote
CSC
Disability
DisabilityTwitter
Disabled
Disabled and access
Disabled and equity
EugenicsByCDC
Handicap
Impaired
Incapable and disabled
Incapacitated
Krip the Vote
KripTheVote
Paralyzed
#NoBodyIsDisposable