Examining privacy concerns and conversations before, during, and after the onset of the COVID-19 pandemic: an analysis of r/privacy

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Abstract

Introduction. The COVID-19 pandemic brought about new and far-ranging uses of technology that have engendered numerous privacy concerns among the public. This study examines discussions in r/privacy, a privacy-focused online community, to gain insight into how the pandemic influenced privacy concerns and behaviours among privacy-interested people.

Method. Our research design included a mixed-method comparative analysis of 540 coded r/privacy posts from three time periods: immediately before the pandemic, during the emergence of COVID-19, and two years after the onset of the pandemic.

Analysis. We performed an inductive, qualitative analysis to understand themes in the data, as well as a statistical analysis to identify key trends and differences in the frequency of themes in the three time periods.

Results. We observed that while some changes were temporary (e.g., viewing the government as a key privacy threat during the pandemic onset), others were long-lasting and increased over time (e.g., seeking privacy-related support).

Conclusion. Our work contributes to the growing literature on how people use social media to collectively make sense of major events by exploring online discourse about privacy issues and offers insights to designers and regulators of new technologies on specific privacy concerns associated with a period of massive sociotechnical upheaval.

Introduction

The COVID-19 pandemic disrupted nearly every aspect of human life on the planet. The ways people worked (Bick et al., 2020), played (Barr & Copeland-Stewart, 2022), socialized and worshiped (Nurain et al., 2021), learned (Parthasarathy & Murugesan, 2020), exercised (Guo & Fussell, 2022), voted (Yoder et al., 2021), sought healthcare (Iacobucci, 2020), and generally lived their lives not only changed but suddenly became subject to new and unfamiliar forms of regulation and surveillance (Aloisi & De Stefano, 2022).

Both scientific literature and popular press noted dangers and actual privacy violations that occurred during the pandemic. For example, contact tracing apps, which use wireless signals to detect when one has been near a person who tested positive for COVID-19, generated scholarly (Bengio et al., 2020) and popular concern (Hautala, 2020). These concerns were validated in part by reports of Google (Ng, 2021) and of governments (Greenberg, 2020) leaking potentially identifiable information from COVID-19 apps used by millions of people. In addition to technologies specifically designed to tackle COVID-19 problems, a number of privacy violations stemmed from people's more extensive use of digital technologies. For example, the shift to videoconferencing software for work meetings and school classes led to multiple privacy concerns, from unwanted guests 'zoom-bombing' or disrupting conferences, to controversial and undisclosed data-sharing with third parties (Cox, 2020). Many people's homes became their workplaces, classrooms, and social venues, allowing others to peer inside what traditionally have been considered private spaces. On top of these technology-driven privacy issues, the social tension surrounding COVID-19 policies and vaccine statuses caused confusion and anger over how and when private health information should be disclosed and even inspired harassment and doxing attacks on public figures and other social media users (Mello et al., 2020; Yeager, 2022).

While studies have looked at people's perceptions of specific technologies during the pandemic (Häring et al., 2021; Herbert et al., 2022; Lan et al., 2020), less is known about changes in people's views on and discourse around privacy issues more broadly. Nearly five years after the outbreak of COVID most people have returned to some semblance of pre-pandemic routines and activities. However, some of the rapid adaptations we made to cope with circumstances during the height of the pandemic may have long-term societal impacts (Willige, 2021). We ask two interrelated research questions:

>**RQ1:** how did the emergence of the COVID-19 pandemic affect privacy perceptions and concerns?

>**RQ2:** how did online discourse around privacy shift, both during the onset of the pandemic and significantly later in the pandemic?

To answer these questions, we designed a study to understand shifts in online privacy discourse during and after the emergence of COVID-19. We collected and analysed posts on the Reddit subcommunity r/privacy from before the pandemic, during its onset, and two years later. Our approach draws heavily on ideas from crisis informatics (Palen & Anderson, 2016), particularly sensemaking, which relies on the concept 'that reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs' (Weick, 1993). Our paper has two primary contributions. First, our findings and analysis contribute insights into how the pandemic influenced people's privacy concerns to those designing technologies and crafting public policies on how to manage crisis events while mitigating privacy concerns. Second, we contribute to the growing body of scholarship on how people use social media to collectively make sense of crisis events by using a longitudinal approach to examine how privacy discussions evolved before, during the onset, and two years into the pandemic.

Related work

Pew Research Center reported that the majority of Americans felt that the internet was 'essential' or 'important' to them during the pandemic (McClain et al., 2021), and factors such as social distancing and shutdowns were strongly correlated to the jump in social media use seen after the onset of COVID-19 (Statista Research Department, 2022). People turned to social media for information about COVID-19 (Cinelli et al., 2020; Goel & Gupta, 2020) and for support on how to get through remote learning (Asghar et al., 2021; Huddart et al., 2020), working from home (Xiong et al., 2021) , and other challenges brought on by lockdowns (Greyling et al., 2021) and social distancing (Geirdal et al., 2021; Wiederhold, 2020). The wide-ranging use of online platforms during the pandemic raises the question of how privacy concerns have been affected and also situates online platforms as an interesting resource for understanding people's privacy-related discussions and concerns.

Crisis informatics is a multidisciplinary field that examines how people use information and communication technologies to manage concerns and uncertainties brought about by disaster events (Palen & Anderson, 2016). Concerns about the use of communication technologies are threaded throughout the lifecycle of an emergency event, from preparation to detection and recovery, and the calibre of collaboration between government, private-sector, volunteer, and citizen respondents greatly impacts resilience to crises (Pipek et al., 2014). In their review of social media within crisis informatics research, Reuter et al. note that the majority of citizen-generated social media content is meant for other citizens and that social media platforms enable citizens to assist one another during crises through the curation of 'self-help communities' (Reuter et al., 2018). Additionally, people use social media as a tool to make sense of the world around them, particularly during extreme events (Heverin & Zach, 2012; Mirbabaie et al., 2021; Stieglitz et al., 2018).

Sensemaking has frequently been used in crisis informatics to investigate how groups make sense of catastrophic events (Stieglitz et al., 2018) including campus shootings (Heverin & Zach, 2012), the Zika epidemic (Kou et al., 2017), Hurricane Irma (Chauhan & Hughes, 2020), and risks associated with COVID-19 (Pine et al., 2021). Sensemaking has also been used as a framework to explore how people make sense of privacy issues. For instance, Van Kleek et al. (Van Kleek et al., 2018) argued that the demand for non-expert users to make expert-like privacy preference decisions in complex information environments should be seen as an exercise in sensemaking. Moreover, Song et al. found that collective privacy sensemaking on Reddit helped individuals grapple with the legal and privacy vulnerabilities associated with period and fertility tracking apps after the U.S. Supreme Court overturned Roe v. Wade resulting in abortion bans in 14 states (Q. Song et al., 2024). The scope and speed of the spread of COVID-19 suggest that people turned to online discussions and spaces to make sense of the crisis. Reddit, in particular, has been investigated in relation to multiple phenomena related to COVID-19, including the collective response to media coverage of the pandemic (Gozzi et al., 2020), the variance in topical and emotional discourses related to COVID-19 among genders (Aggarwal et al., 2020), and public sentiment toward COVID-19 vaccines (Melton et al., 2021). Our study contributes to the expanding body of literature about how people collectively use social media to make sense of crisis events by exploring the changes in privacy discussions before, during, and after the onset of the COVID-19 pandemic.

Method

To understand what kinds of privacy-related threats people discussed before, during, and after the emergence of the COVID-19 pandemic, we turned to the subcommunity, r/privacy, on the popular social media platform Reddit. This is an online space where people concerned with privacy-related issues congregate to share and discuss ideas. We used the Pushshift open API (Baumgartner et al., 2020) to query Reddit data from November 2019 through December 2022. To analyze changes over time, we partitioned the data into two nine-month waves. The first was a nine-month period from

November 2019-July 2020, which included the four months before the World Health Organization's (WHO's) recognition in March 2020 of a global pandemic (November 2019–February 2020), and the five months including and following WHO's recognition (March 2020–July 2020) and totalled 23,405 posts. To determine if the changes we observed at the onset of the pandemic persisted, we then analysed data from an additional nine-month time period two years later (November 2021–July 2022), which yielded 16,092 additional posts and metadata for a total of 39,497 posts. The decision was made to select the same nine-month period two years later to control for seasonal variations.
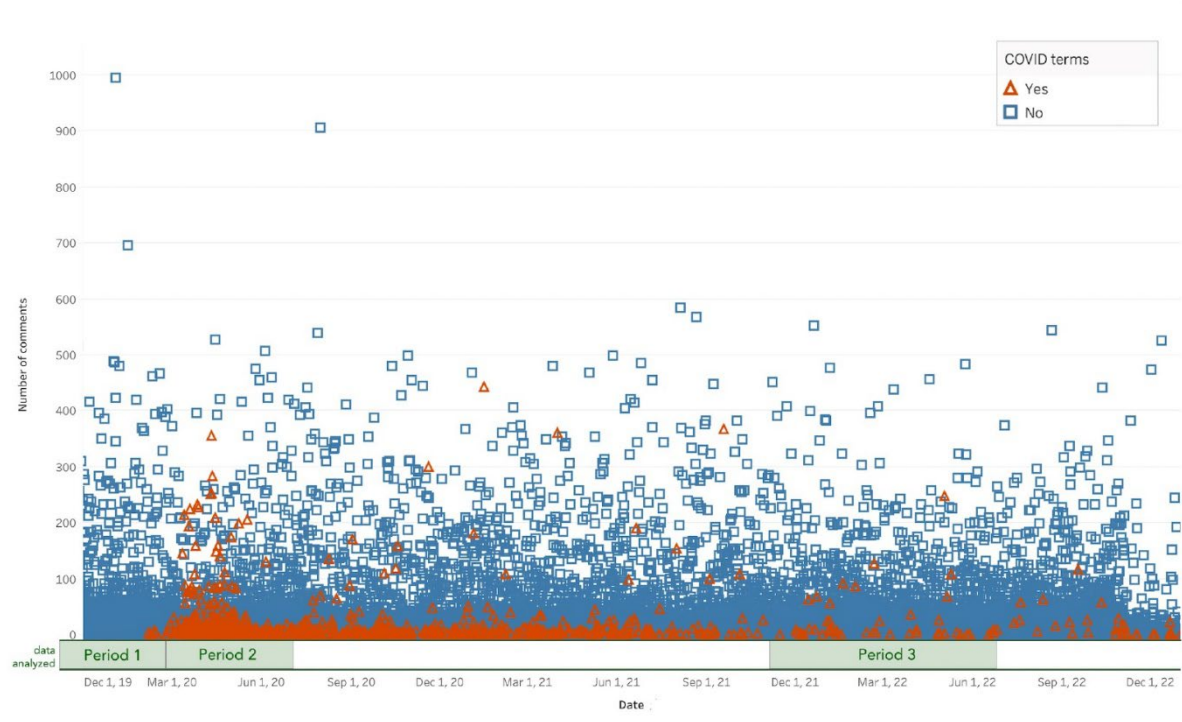

Figure 1. r/privacy posts from November 2019 through December 2022 by date posted (X-axis) and number of comments on each post (Y-axis). Blue square points indicate that the post did not contain a COVID-related term, red triangular points indicate the post contained a COVID-related term.

We used the number of comments that each post received as a proxy for the level of community attention to the topic. Comments indicate the posts to which people pay enough attention to respond; they are an internally consistent metric in that Reddit uses them (along with upvotes and other measures) to determine which posts to foreground (i.e., which posts will subsequently receive more attention). As an initial pass to identify COVID-related posts in our dataset, we chose a list of COVID-related terms ('COVID,' *'coronavirus,'* *'quarantine,'* *and* *'pandemic'*) and plotted the total number of posts across time to see how many contained these terms. These results (Figure 1) bolstered our choice of March 1, 2020, as a reasonable division between period 1 and period 2. To investigate changes in privacy topics on r/privacy after the emergence of COVID, we filtered the top 30 most-commented posts per month from all three data periods regardless of whether they included COVID-related terms. This yielded 540 posts. In the few instances where one of the top commented posts had been deleted, we included the next most commented-on post. Throughout the paper, we refer to these groupings of data as follows:

> **Period 1**: Before Pandemic Onset (November 2019–February 2020)

> **Period 2**: During Pandemic Onset (March 2020-July 2020)

Period 3: Later-stage Pandemic (November 2021-July 2022)

Analysis

We performed an inductive, qualitative analysis to understand themes in the data, as well as a statistical analysis to identify key trends and differences in the frequency of themes before and during the onset of the pandemic and whether those trends persisted two years later. The first author led all analyses. For the qualitative analysis, the first two authors initially explored data from the first and second time periods independently, using open codes and memos to identify emerging concepts. We used these concepts to build a draft codebook, on which the team iterated by doing multiple rounds of exploratory coding. The team met regularly to discuss the codebook and make necessary amendments. Categories in the finalized codebook included (1) Motivations (what the poster was seeking by posting in the forum based either on inference or directly stated by the poster), (2) Issue/Topic (what the post was about), and (3) Source (the source of the privacy threat discussed in the post).

To test inter-coder reliability, the first two authors coded small subsets of data and calculated IRR using Krippendorff's Alpha until good agreement (0.712) was reached. The first two authors then divided and coded the posts from the first and second periods containing the 30 top-commented posts from each of the 9 months for a total of 270 posts. Post title, content, and the text from URLs included anywhere in the post were included in the analysis (linked content outside of the post was not analysed). It was agreed that posts that were unrelated to privacy or too sparse to be coded would be dropped. One post was determined to be uncodeable and dropped from the analysis. In total, we analysed 269 posts from the first and second time periods.

The first and third authors did multiple rounds of coding using a subset of posts from the third time period and calculated IRR using Krippendorff's Alpha until satisfactory agreement was reached (0.903). The first and third authors then split and coded the posts from the third time period resulting in 270 posts.

We also performed a statistical analysis to identify the types of posts that changed most significantly before and after the emergence of COVID-19. An R script was used to run a multinomial logistic regression analysis. Multinomial logistic regression was chosen because it provides a single statistical analysis to ascertain which differences in proportions across the three time periods are statistically significant, as opposed to, say, conducting multiple chi-square tests. Since only a single model is constructed, all relationships (between each of the codes and the time period for a post) are tested simultaneously. Furthermore, since all codes are used as predictors, the model accounts for the simultaneous relationships each different code might have with the time period. Finally, the results of this approach can be interpreted as indicating whether a post with certain values for each code is significantly more or less likely to have been made during one of the three time periods in our dataset.

Additionally, we visualized our results using effects plots (Cook, 2009). Each predictor is categorical, with 6, 5, and 4 levels, respectively (due to their small representation in the dataset, the posts coded Other in the Motivations category and the posts coded Schools, Employers, and Other in the Source of Threat category were removed for the statistical analysis). One value is chosen as the reference level—we chose the most common values in the post-COVID data (Peng & MacKenzie, 2014), based on the Total column in Figure 2.

Ethical considerations

Posts on the subreddit r/privacy are publicly accessible. However, using public data can still give rise to ethical concerns, especially in terms of identifying individual Redditors. Thus, any quotes from posts are lightly paraphrased to protect the privacy of Redditors (Reagle & Gaur, 2022).

Findings

		Before Onset	During Onset	Later Stage	Total
Motivation	Seeking Support	4.20%	7.30%	14.07%	10.02%
	Giving Support	10.10%	8.70%	7.41%	8.35%
	Raising Awareness	68.90%	70.00%	59.63%	64.56%
	Venting	4.20%	2.00%	3.33%	3.35%
	Personal Journey	5.00%	4.00%	7.04%	5.75%
	Discussion Prompt	3.40%	8.00%	8.52%	7.24%
	Other	2.50%	0%	0%	0.56%
Issue/Topic	Privacy Concern	5.90%	7.30%	16.30%	11.50%
	Actual Violation	34%	24%	23.33%	25.97%
	Privacy Strategy	18.50%	22.70%	13.70%	17.25%
	Current Events	32.80%	40.70%	45.56%	41.37%
	Other	8.40%	5.30%	1.11%	3.90%
Source of Threat	Technology Companies	52.90%	50.70%	48.52%	48.98%
	Governments	13.40%	25.30%	18.52%	19.29%
	Schools	0.10%	2.70%	1.48%	1.67%
	Employers	0.10%	0.10%	1.11%	0.93%
	Broad/Unspecified	26.10%	20%	25.56%	24.12%
	Individual Bad Actor	1.70%	3.70%	4.81%	3.53%
	Other	4.20%	2%	0%	1.48%

Figure 2. Percentage of codes in each category before the onset, during the onset of, and in the later stage of the COVID-19 pandemic.

		During Onset		Later Stage	
Predictor	Code	Odds Ratio	p-value	Odds Ratio	p-value
Motivation	Discussion Prompt	3.28	0.0763*	5.74	0.0074*
	Giving Support	0.931	0.891	2.17	0.132
	Personal Journey	1.17	0.812	4.14	0.0162*
	Seeking Support	2.04	0.283	9.22	< 0.001*
	Venting	0.43	0.334	2.33	0.187
Issue / Topic	Privacy Concern	0.91	0.862	0.70	0.493
	Actual Violation	0.57	1.008	0.25	2.689
	Privacy Strategy	1.28	0.606	0.190	< 0.001*
	Other	0.54	3.435	0.04	1.719
Source of Threat	Individual Bad Actor	3.89	0.237	4.63	0.159
	Governments	2.006	0.058*	1.192	0.617
	Broad/Unspecified	0.649	0.231	1.03	0.927

Figure 3. Impacts of each code for each of the three predictors, one for each category, and one outcome variable, Time. Odds ratios indicate the probability of a post with that code being in the time period during the onset of the pandemic (centre columns) or two years after the onset of the pandemic (right columns) compared with before the pandemic. The most common values in the post-COVID data were used as reference levels (*Motivation: Raising Awareness, Issue/Topic: Current Events, Source of Threat: Technology Companies*). Codes that represented less than 2% of the total dataset were dropped from the analysis. *Two values were significant at the *p* < 0.1 level in During Onset: *Motivation: Discussion, Source of Threat: Governments*. Four values were significant at the *p* < 0.1 level in Later Stage: *Motivation: Discussion, Motivation: Personal Journeys, Motivation: Seeking Support, Issue/Topic: Strategy*.

In this section, we examine our thematic analysis, focusing on the themes that varied significantly across time periods. Figure 2 shows the coded proportions of posts from each time period. Figure 3 shows the results of the multinomial regression analysis, in terms of Odds Ratios (ORs) and statistical significance (p-values). While ORs provide statistical precision, they can sometimes make it difficult to interpret the simultaneous impact of a single predictor on all levels of the outcome variable. Thus, we supplement these model details with three effects plots [12] (Figures 4-6).
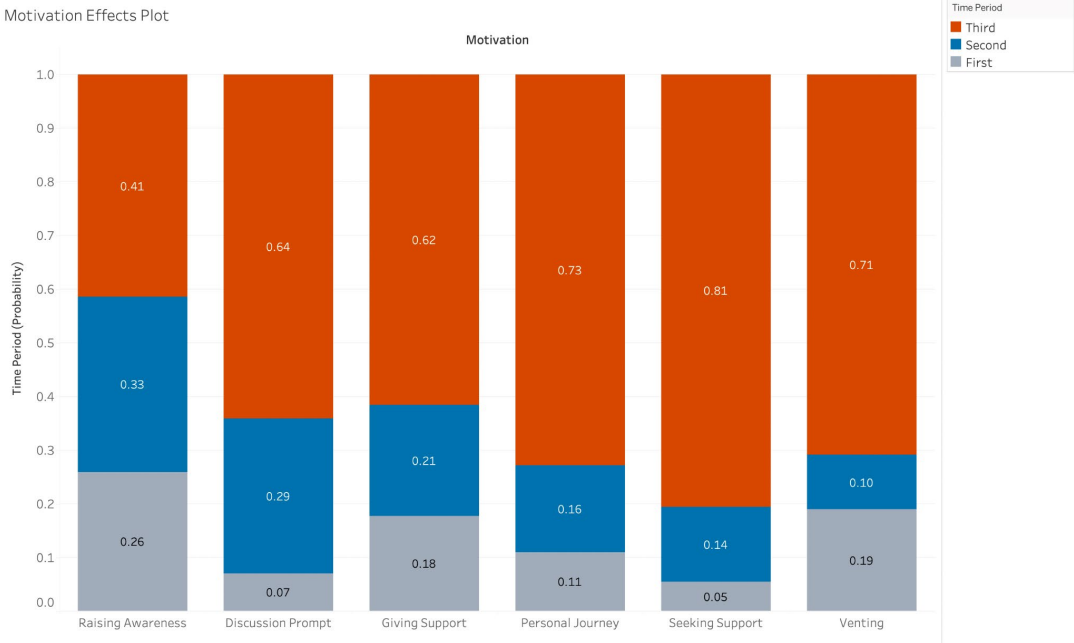

Figure 4. Visualization of Odds Ratios (ORs): Effects plot showing how different values of the Motivation code affect the probability of the post coming from each of the three time periods
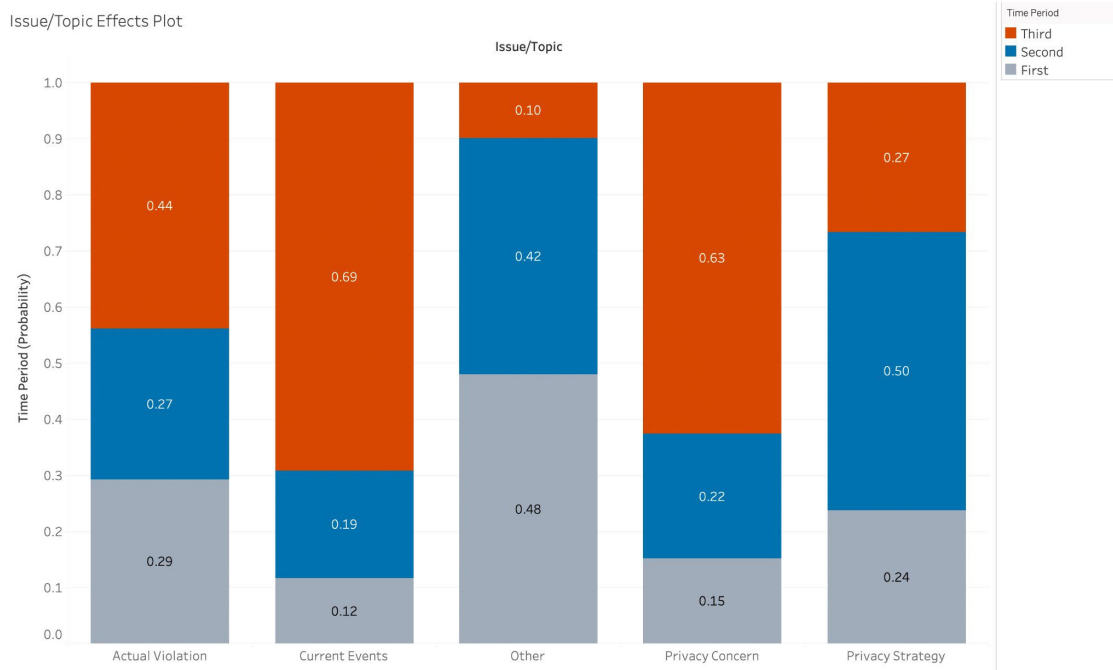
Figure 5. Visualization of Odds Ratios (ORs): Effects plot showing how different values of the Issue / Topic code affect the probability of the post coming from each of the three time periods
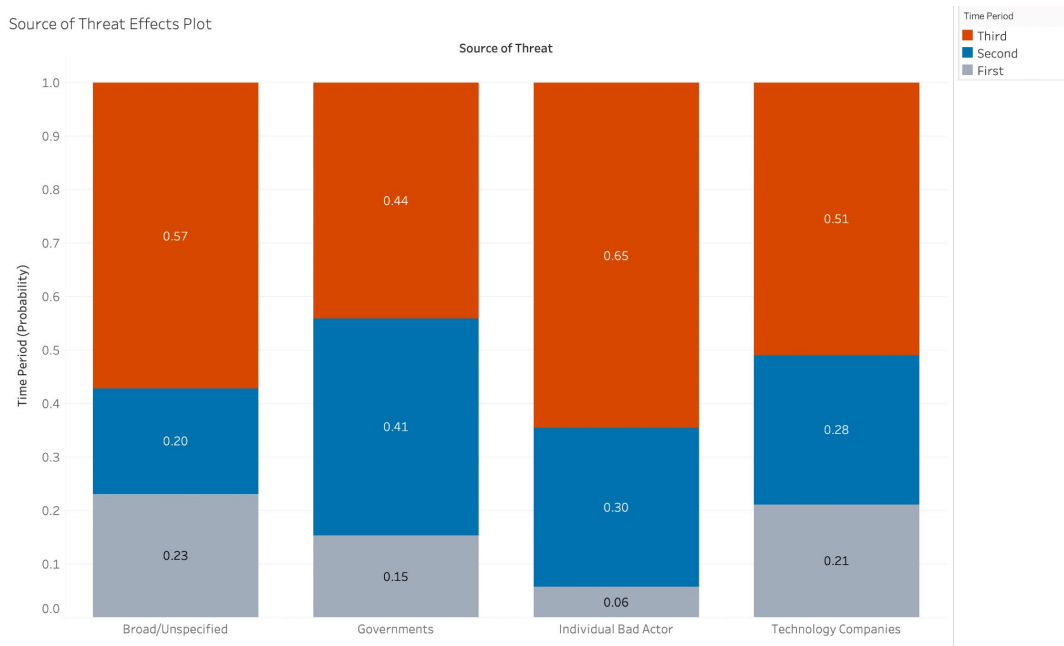

Figure 6. Visualization of Odds Ratios (ORs): Effects plot showing how different values of the Source of Threat code affect the probability of the post coming from each of the three time periods

Motivations: why post on r/privacy?

Prompting discussions

Sometimes posts served to spark a conversation about privacy issues and actively solicited feedback from the community. The number of posts containing these discussion prompts was relatively low before the pandemic, increased during the emergence of the pandemic (OR=3.28,

p=0.0763) and remained at a significantly elevated level two years later compared to before the pandemic (OR=5.74, p=0.0074). Some of the posts after the onset of the pandemic raised privacy-related perspectives unique to circumstances related to COVID-19, such as this post about face masks:

> *face masks are one of the only defences against awful facial recognition algorithms that are used against people in both public and private... How long can people continue to wear face masks? After the virus is over, will wearing face masks in public still be seen as socially acceptable? How else can we protect our privacy during the pandemic? (Period 2 During Onset)*

While others posed conceptual questions to the privacy community:

> *with all of the monstrous privacy violations that are so commonplace today, is this the end of privacy as we know it? Is there any hope for the future of privacy? (Period 2 During Onset)*

These posts were an exercise in sensemaking: they invited the community to contribute to an exchange about general privacy concerns and to discuss both personal and community stances on various privacy issues. Two years later, discussion prompts increased, for example, this query about how to safeguard privacy when living in an often-unsympathetic society:

> *Hello– I am writing this post to spark some kind of discussion about the tribulations of trying to maintain or reclaim your digital freedom and online privacy...Nobody I know cares about privacy and I'm not sure about you, but I do not have anybody that I can talk to about this IRL that wouldn't think I'm a tinfoil hat weirdo or that could actually add something to the conversation. Is this just a lost cause? (Period 3 Later Stage)*

The increase in the number of discussion prompts during the emergence of the pandemic suggests that rather than using Reddit to vent about frustrations, people turned to the community to better understand how the pandemic would impact privacy-related matters of importance to them. The persistence of higher numbers of discussion posts two years indicates that Redditors were still turning to this community to help make sense of their privacy concerns during a time of continued uncertainty.

Personal journeys

Personal journey posts also increased significantly in the later stage time period (OR=4.14, p=0.0162) (5.75%). Some posts included reflections on what shaped their current privacy practices and attitudes:

> *after paying a lot of attention to privacy news this year, I decided to stop using the same password for everything. I just spent a few hours coming up with new passwords for everything using a different strategy. (Period 1 Before Onset)*

Other posts shared struggles with negotiating their privacy preferences at work:

> *even though I told them no, my work keeps demanding I share my screen with them for pair programming. This is what I told them: "When I accepted this job, even though I agreed to work on my personal computer, I never agreed to share my screen. I find it unacceptable that this company is restricting me from what I do with my own computer. I want my personal and work life separate." I anticipate that I am probably going to have to go along with screen sharing with a virtual machine because I can't lose my job over this... (Period 3 Later Stage)*

Notably, none of the personal journey posts from our dataset refer to COVID. However, a commonality in the personal journey posts is the apparent anticipated contextual understanding

from the r/privacy community. Whether a post simply reported changing passwords or a troubling experience at work, the announcement of the personal update was rarely accompanied with an explanation of why or how the action was related to their privacy concerns–it was implied the fellow community members would understand. The increase in these types of posts suggests individuals' elevated desires in Period 3 to document life events within a supportive community.

Seeking support

These posts sought help for various privacy-related issues (10.02.%) and reflected wide-ranging concerns, from seeking informational support, such as how to prevent entities from monitoring their personal web traffic, to posts seeking emotional support, such as negotiating boundaries with family. Questions seeking support increased after the onset of the pandemic, such as this one: '*does anybody have thoughts about why all these cameras are being put up around my neighborhood?*' (Period 2 During Onset).

While we expected that people may have had more questions about keeping their privacy safe during COVID-19, we found that most seeking help posts were not looking for help around COVID-related issues. Two years later, the percentage of seeking support posts increased significantly (OR=9.22, p < 0.001), yet none of these posts were explicitly about pandemic-related topics. For example, this poster wanted to know if it was possible for their Facebook messages to be tracked even after they were deleted: '*if I erase my FB posts and messages will anyone still be able to find them or prove they ever existed*' (Period 3 Later Stage).

Other posts sought emotional support, such as this post on how to communicate privacy concerns to family members:

> *My mom (and dad) loves social media and have always put a lot of pictures of me and my siblings on their pages. Now that I'm older, I value my privacy and it upsets me that there are so many photos of me out there...Please let me know if I'm overreacting. I wonder if it would be rude to ask them to take the photos down* (Period 3 Later Stage).

This rise in support-seeking posts in the later stage period may be rooted in the r/privacy community experiencing elevated uncertainty about their privacy in relation to previously routine activities that were called into question after a period of rapid societal change.

Raising awareness/advocacy

The majority of posts (64.56%) throughout the period of our analysis were about raising awareness or fueling advocacy efforts on privacy topics. These efforts included posting about both potential and actual privacy issues and violations (e.g., data leaks, bad practices). Unsurprisingly, during the onset of the pandemic we also saw many news articles shared about the impact of COVID, such as: '*Covid-19 is normalising mass surveillance of citizens*' (Period 2 During Onset).

As the type of posts tended to follow the news cycle, shared headlines about COVID had petered out in Period 3 in favour of posts reflecting current events, such as: '*now that Roe v. Wade has been overturned, your abortion searches could be used to prosecute you*' (Period 3 Later Stage).

Although the topics changed, overall, we did not see a significant change in the frequency of these types of posts throughout our analysis, suggesting that these posts are an enduring and key part of r/privacy discussions. We can look at posts of this nature during different stages of the pandemic to gain insight into which issues were generating interest.

Topics: what did people post about?

Privacy strategies

Posts about privacy strategies discussed actions that could be taken to protect one's privacy. There was a bump in the proportion of posts that referred to privacy strategies at the onset of the

pandemic. We speculate that the shift from posts about actual privacy violations to privacy-protective strategies at the emergence of the pandemic might be due to community members' attempts to find ways to navigate perceived or poorly understood threats brought on by the pandemic. Some of these posts involved workarounds to COVID-related technologies:

> *iOS has contact tracing enabled by default. If you want to leave contact tracing enabled, you're automatically opted in, so you don't have to do anything, but if you want to opt out like most people, here's how you do it...* (Period 2 During Onset)

Some community members recognized that people had to use technologies that could be problematic for privacy during the pandemic due to the shift to remote work. In such cases, posts shared tips for protecting privacy while using these technologies, such as the following post about videoconferencing software: *'we're all probably tired of hearing about the Zoom privacy fiasco. If you have to use it, here's some tips to do it safer...'* (Period 2 During Onset).

Two years later, the percentage of posts about privacy protective strategies had declined significantly compared with pre-pandemic levels (OR=0.190, p < 0.001) and none of the posts in this category in our sample referred to COVID specifically. This decline might be a result from a downtrend in the need to rapidly adopt new strategies to adjust to incomparable circumstances brought on by the emergence of COVID.

Privacy concerns

Posts about privacy concerns discussed a worry or uncertainty about a privacy issue but did not explicitly report an actual privacy violation. The percentage of these types of posts was relatively stable from before COVID-19 through the onset of the pandemic, but there was an increase during the later stage time period. During Period 3, concerns were commonly about either technology company developments or policy changes (*'Will you continue to use DuckDuckGo after this announcement?'* (Period 3 Later Stage)) or concerns about potential violations (*'Is a Linux or Apple laptop more difficult for law enforcement to get into?'* (Period 3 Later Stage)). Overall, this shift from posts about privacy strategies to privacy concerns reveals a transition from an interest in action-oriented posts to those of suspicion and unease.

Current events

Posts about current events included discussions about new laws or court cases, public stances by politicians, or other current events in the news. These posts were frequent both before and during the pandemic, though they increased in frequency after the start of the pandemic (32.8% to 40.7%) and increased further two years later (45.56%). In the four months following the emergence of COVID-19, several posts focused on how the pandemic was impacting privacy concerns and violations. For example, the following headline considered the impact of remote education on students' privacy and safety: *'teacher Spying on Student During Virtual Class Sends Cops to Search 11-Year-Old's Home After Spotting a BB Gun'* (Period 2 During Onset).

Posts that called out COVID by name had nearly ceased by the later stage time period, but most of the posts that mentioned COVID were current event posts, such as this one: *'CDC Monitored Millions of Phones to Discover If Americans Followed COVID Lockdown Orders'* (Period 3 Later Stage).

The increase in attention to current events posts during the onset of COVID-19 indicates a heightened interest in breaking and developing news stories that continued to grow in the later stage of the pandemic.

What were the sources of perceived threats?

Governments

The greatest increase in source of threat after the emergence of the pandemic was by governments (OR=2.006, p=0.058). After COVID-19 emerged, posts that cited governments as the main source of threat often highlighted current actions (or suspected actions) involving governments. Some of these posts relayed official announcements:

> *today, Argentinian President Alberto Fernández announced that workers returning to work after lockdown will be required to download an application for their phones which will track and record their location* (Period 2 During Onset).

Other posts detailed government actions that might have been occurring covertly:

> *the FBI is promoting a home-workout app for people stuck indoors during the coronavirus outbreak. It also tracks your location and which WiFi networks you're using* (Period 2 During Onset).

In addition to specific technologies, apps, and services being espoused by governments in response to the pandemic, several posts also voiced concerns about governments using the pandemic to put broader surveillance structures in place: 'Snowden Warns Governments Are Using Coronavirus to Build 'the Architecture of Oppression' (Period 2 During Onset).

It is interesting to note here that rather than posting about actual violations that had been reported where the government was identified as the source of threat, there was an increase in posts that questioned how governments were balancing (or taking advantage of) measures to control COVID-19 and the privacy rights of individuals. The frequency of posts with governments as a source of threat had decreased to 18.52% two years later. As the pandemic wore on and some of the restrictions lessened, so did the appearance of governments as a source of threat posts in our dataset.

Technology companies

Throughout our period of data collection, technology companies were the most frequently cited source of privacy threats (48.98%). Perhaps unsurprisingly, posts that were concerned about tech companies more frequently referenced Zoom and other video conferencing technologies after the pandemic began. Some of these posts contained links to stories that included factual information about problems with Zoom, such as the following: '*ex-NSA hacker finds new Zoom flaws to takeover Macs again, including webcam, mic, and root access*' (Period 2 During Onset).

In contrast, some posts were impassioned appeals, likely brought about by the sudden and ubiquitous use of video conferencing software in several domains of life, including education and work, such as 'For the love of God, stop using Zoom!' (Period 2 During Onset). Interestingly, the number of mentions of Zoom or other videoconferencing tools dropped back down to zero just two years later—perhaps an indication of how interwoven these technologies have become in people's daily routines.

Discussion

The impact of COVID-19 on people's privacy perceptions and concerns

During the rapid technological shifts caused by the pandemic, people became increasingly dependent on technologies—both new and existing—that were integrated into many aspects of daily life. In our data, we saw that seeking-support posts increased at the onset of the pandemic. This signals that people felt their existing privacy strategies were insufficient to protect them from threats they were experiencing at the time. Thus, at the onset of the pandemic, the subreddit became a space where posters increasingly sought ways to mitigate unfamiliar obstacles. By

identifying these trends, attention can further be drawn toward the specific issues being discussed during periods of rapid societal change. This may help those designing, implementing, and regulating new technologies and strategies to deal with evolving crises by promptly identifying privacy flaws or areas of concern. For example, at the onset and in the later stage of the pandemic we observed an uptick in support-seeking related to suspicions about phones or other devices being tracked by individual actors such as family members, neighbours, employers, or schools. Although these posts did not discuss COVID-related technologies, a reasonable interpretation is that media coverage and discussion of privacy concerns about contact tracing apps had stoked fears about the possibility of being tracked by other entities. Designing for transparency around tracking capabilities or enabling tracking preferences becomes a more crucial privacy design recommendation in a world with heightened concerns about tracking.

At the onset of the pandemic, we also saw a growth in posts about governmental actors as the source of threat. This finding is likely because when the pandemic emerged, governments were the most salient entities responsible for changes to people's lives via COVID-related mandates. The relationship between volunteer/community resources and official governmental responses is a resurfacing theme in crisis informatics research (Douglas et al., 2018; Kavanaugh et al., 2011); as per the crisis informatics community, decreasing loss of life and damages caused by crises depends on successful collaboration between governments, professionals, volunteers, and citizen respondents (Pipek et al., 2014). Prior work finds that the dissemination of quality information on social media helps increase the public's trust in government (Arshad & Khurram, 2020; Bertot et al., 2010; C. Song & Lee, 2016). Our findings suggest that during the onset of the pandemic, when there was a significant increase in posts identifying governments as a source of threat, it may have been advantageous for government agencies to increase their usage of social media as a channel to circulate information on privacy policies related to new public health technologies and practices. Governments can look to social media channels such as r/privacy during periods of crisis or rapid social change as a way to probe levels of public confidence, identify misconceptions, and work toward mitigating privacy issues that raise concerns among citizens.

Collaborative sensemaking in online discourse around privacy during the pandemic

We observed an increase in posts that sought to spur discussions about privacy-related topics on r/privacy during the onset of the pandemic. Our longitudinal approach revealed that two years later, this trend had continued. This trend suggests a sustained interest among r/privacy users in others' perspectives on privacy-related dilemmas. By turning to an online community of like-minded people, r/privacy members had opportunities to collaboratively make sense of the privacy implications of the technological shifts brought about by the pandemic. Research finds that people collaborate to make sense of privacy issues (Murthy et al., 2021; Q. Song et al., 2024; Watson et al., 2020), as well as to organize against privacy threats through collective action (Das et al., 2021; Vincent et al., 2021). Our findings suggest that, once established, the practice of inviting collaborative sensemaking persisted in r/privacy.

The data also revealed a significant increase in posts about users' personal journeys related to privacy. These posts were similar to diary or journal entries—they reported personal privacy-related activities or milestones for seemingly no other purpose than to have them on record. Diaries have been looked at as sensemaking activities (Elsden et al., 2016) and qualitative diary data has been used to offer insight to policymakers about people's perspectives, experiences, and coping mechanisms during COVID-19 (Mueller et al., 2023; Terzis et al., 2022). Our findings suggest that researchers may be able to turn to online communities to access some of these traditionally private sensemaking practices. Like, blogs, posts about personal journeys in our dataset differ from traditional diary entries in that they are publicly shared with an online community. We speculate

that self-disclosures serve to reinforce the sense of community, establish norms, and create a conducive environment for sensemaking.

Limitations

Since we analysed a subreddit that focuses on privacy issues, our findings reflect the privacy concerns and attitudes of people who care about privacy and actively seek discussions about it. We believe that focusing on this community gives us valuable insight into how a community collectively navigates privacy issues; however, our data does not reflect the impact of the pandemic on people for whom privacy is less of a salient concern or who do not choose to discuss privacy issues online.

Further, while we focused on the effect that COVID-19 had on privacy concerns, we note that the pandemic was not the only major event that took place during the time period of our analysis. For example, some of the posts in our dataset referenced privacy-related concerns in the wake of protests occurring after the murder of George Floyd in 2020. These events may also contribute to our findings, especially around governmental actors being seen as a source of threat.

Conclusion

Robert Soden has called for a long view of crises, writing, 'Disasters reverberate through the history of the places in which they occur. Long after the period of crisis is deemed to be over, they continue to have impact, foreclosing some possible futures, and opening others' (Soden & Palen, 2018). Inspired by Soden, we aimed to understand how people's privacy concerns and behaviours may have changed and may continue to change in light of an enduring crisis that has unfolded over multiple years—the COVID-19 pandemic. We conducted a thematic analysis of the 540 posts that received the highest number of comments on r/privacy to understand the most commonly discussed privacy topics, concerns, and behaviours during these time periods. Although some changes were temporary (e.g., viewing the government as a key privacy threat during the pandemic onset), others were long-lasting and increased over time (e.g., seeking privacy-related support). These findings contribute to growing literature on how people use social media to collectively make sense of catastrophic events by providing insight into privacy-related collaborative sensemaking practices during a crisis. Further, by examining privacy discussions during multiple points of the pandemic, we show that privacy concerns and behaviours in the wake of a global crisis are continuously shifting and warrant attention over time.

Acknowledgements

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