Using social media Reddit data to examine foster families' concerns and needs during COVID-19[☆]

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ABSTRACT

Background: COVID-19 is likely to have negatively impacted foster families but few data sources are available to confirm this.
Objective: The current study used Reddit social media data to examine how foster families are faring in the pandemic. Discussion topics were identified and examined for changes before and after COVID-19.
Participants and setting: Comments were collected from three Reddit online discussion boards dedicated to foster families ($N = 11,830$).
Methods: We used machine learning techniques, including Latent Dirichlet Allocation, for topic modeling and textual analysis for qualitative coding of the Reddit comments.
Results: Results showed that three main topics had both significant quantitative and meaningful qualitative changes before and after COVID-19. There were significant increases in conversation about *becoming a foster parent* ($F = 5.75$, $p = 0.02$) and *activities for foster children* ($F = 10.61$, $p = 0.001$), whereas there was a significant decrease in discussing *permanency* ($F = 9.46$, $p = 0.003$) before and after the onset of COVID-19. Qualitative coding showed that regarding the topic of *becoming a parent*, excitement over approval of foster care license before COVID-19 shifted to foster families' increased anxieties about delays in their licensing cases after COVID-19. For *permanency*, content changed from the best interest of the child and reunifications before COVID-19 to concerns over family separations and permanency challenges after COVID-19. Regarding *activities for foster children*, content related to everyday activities before COVID-19 changed to specific activities foster children and families could do during lockdowns. Results suggest areas child welfare workers may focus on to better support foster families during and after the pandemic.

1. Introduction

The COVID-19 global pandemic has been challenging for vulnerable individuals in our society, including foster children and their families who have been separated from their usual support systems. There are more than 425,000 children in foster care in the United

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States (Children's Bureau, 2019). Even prior to the COVID-19 global pandemic, foster children represented some of the most vulnerable populations, with multiple adverse childhood experiences, traumas, uncertainties, and changes in their lives (Engler et al., 2020; Rebbe et al., 2017). Relatedly, the child welfare system has a number of shortcomings and thus is often characterized as suffering from maladies, including foster children's multiple placements, overprescription of psychotropic drugs, inadequate health and mental health services, and placement in unsafe homes (Lee et al., 2019; Sankaran & Church, 2020).

During COVID-19, courts were functioning at a limited capacity and family visitations were suspended (Jackman, 2020). With past research showing increases in child abuse and neglect during disasters (Curtis et al., 2000; Griffith, 2020; Humphreys et al., 2020; Lawson et al., 2020), child welfare experts and professionals projected, especially early on in the pandemic, that matters would worsen for the child welfare system and its service populations as the pandemic wears on (Staples, 2020). With stay-at-home orders and lockdowns, child welfare workers had limited contact with foster families, and thus it was uncertain how foster children and their caregivers were faring in the early months of the pandemic (Jentsch & Schnock, 2020). To address this knowledge gap, the present study used an innovative source of social media data obtained from Reddit to better understand foster children and their families' wellbeing by examining some of their most pressing concerns during the early months of COVID-19. This study makes a contribution to the literature by using a theoretical model on the impact of natural disasters on children to examine the data and interpret the results, combining both machine learning techniques with traditional qualitative methodologies, and providing practice and policy recommendations that may be responsive to a different array of family needs during and after COVID-19.

2. Concerns related to foster families during COVID-19

In the wake of COVID-19, child welfare officials voiced concerns over the anticipated high numbers of child maltreatment incidents, many of which may stem from pandemic-related economic stressors, that are likely to go unreported (Hager, 2020). Related to this is the severely decreased numbers of child abuse and neglect report cases during COVID-19 (Baron et al., 2020; Bullinger et al., 2020). For example, using national datasets, researchers at Chapin Hall at the University of Chicago found that reports of child maltreatment were 40–60% lower in 2020 compared to similar time periods in 2019 (Weiner et al., 2020). School personnel, including teachers, most frequently reported suspected child abuse and neglect, but with school and daycare closures in the early months of the pandemic, children were stripped of their usual safeguards (Stewart, 2020). These abrupt drops in child maltreatment reports suggested that child abuse and neglect may be happening behind closed doors during stay-at-home orders and lockdowns and that many of these cases may be going unreported (Stewart, 2020). Importantly, much like the general population, foster families were likely to be equally exposed to these child maltreatment risks during the pandemic.

Added to this was the pandemic induced economic downturn and skyrocketing unemployment rate (14.4%) (Kochhar, 2020). This means families may have experienced high levels of financial stress and economic instability, which are not only risk factors for child maltreatment (Fore & Cappa, 2020; Herrenkohl et al., 2020; Lawson et al., 2020), but also factors that prevent foster parents from adequately meeting the material needs of children in their care (Dodge, 2021). These circumstances—high incidents of child maltreatment but low report rates combined with economic hardships—suggest the need to consider different array of family needs that require a new set of responses by the child welfare system to best protect and support vulnerable children and families.

Relatedly, COVID-19 has severely impacted the child welfare system and revealed its tenuous nature. Much of the child welfare work force halted activities indefinitely or went remote unless considered essential work (e.g., child maltreatment investigation) (Pisani-Jacques, 2020; Welch & Haskins, 2020). This transition to virtual work was not uniform across the country (Dodge, 2021). Further, child welfare workers were prevented from providing services to foster families, including in-person visits with foster children (Welch & Haskins, 2020). These resulted in delays in placements and adoptions, as well as older foster youth aging out of the system during a public health emergency and economic crisis (Dodge, 2021). Importantly, social distancing guidelines resulted in limited in-person contacts foster children were allowed to have with their biological parents (Singer & Brodzinsky, 2020). In-person visitations with biological parents were postponed or transferred over to video conferencing (Singer & Brodzinsky, 2020), which were likely to be challenging for children (Astuto & Allen, 2009). Some have raised concerns that such severe reductions in regular social support mechanisms may negatively impact foster children's development (e.g., triggering traumatic memories of being separated from their social networks, including family members and friends) and foster parents' abilities to help children in their care cope with the effects of COVID-19 (Waite & Partap, 2020). Importantly, there was a general lack of data on foster families related to COVID-19, preventing opportunities to empirically assess how foster children and their caregivers were doing and what their specific needs were, especially during the early months of the pandemic.

3. Using social media to study vulnerable children and families

Social media can be a useful source of data for researchers, especially when trying to examine topics that are considered "taboo" (e. g., vaccination, circumcision, spanking) based on common societal norms or when trying to better understand difficult-to-reach populations (Ammari & Schoenebeck, 2015; Caplan et al., 2017; J. Y. Lee, Grogan-Kaylor, et al., 2020). Some social media data, including those by Reddit and Twitter, are considered publicly available data and have the potential to capture users' thoughts and behaviors in a naturalistic online environment, where users may be less concerned about appearing socially desirable to those observing their behaviors or studying their responses as in traditional research settings (J. Y. Lee, Grogan-Kaylor, et al., 2020). In general, social media users tend to be younger, with higher education levels than those of the general public (Pew Research Center, 2019; Statistica, 2021). Specific to Reddit, a recent Statistica (2021) survey showed that the most common Reddit users were likely to be young, with the largest share of users being between the ages of 18–29 (22%), from the U.S., and identifying as male than female

(15% vs. 8%).

Using social media data during the early months of COVID-19 to study vulnerable children and families seemed particularly helpful, given that contacts between child welfare workers and foster families were limited. In fact, researchers were beginning to use social media data to examine the role of COVID-19 in children's lives, including children's exposure to violence. For example, Babvey et al. (2020) used both Twitter and Reddit to examine children's exposure to violent online content during COVID-19 lockdowns. Using natural language processing, the researchers found that there were increases in children's exposure to abusive and hateful conversations on both social media platforms. Although the researchers shed light on patterns of children's exposure to online violence, the exact content of such conversations were not fully examined and the study lacked a theory that could help guide the interpretation of results and their implications for child welfare practice and policy.

Child welfare researchers using text-based social media, such as Reddit, as a data source should leverage the rich textual component of such data. Not doing so is a missed opportunity, given that qualitative analysis of such rich text data can give important insights into the nuanced experiences of social media users (i.e., foster parents and former foster youth for this study). Relatedly, quantitative data are too often thought to be superior to qualitative data, but quantitative data fail to capture the details of individuals' lived experiences. The value of using Reddit data lies in the ability to conduct in-depth qualitative analysis (and quantitative analysis given its "big data" nature). In-depth qualitative analysis is possible because Reddit users tend to create text-based posts and use threads for subsequent commenting. For the current study, Reddit served as an important qualitative (and quantitative) data source, allowing us to capture COVID-19 related challenges voiced directly by foster families.

4. Guiding theoretical framework

Kousky's (2016) theorization of how natural disasters impact children and families guided the current work. Kousky (2016) notes that the impact of natural disasters on children and families have almost exclusively focused on three domains: (1) children's and families' physical health (e.g., limited access to medical care, physical injury or illness); (2) mental health (e.g., grief and loss around separation from parents and caregivers, witness of caregivers undergoing stress, abuse and neglect, breakdown of social networks); and (3) education (e.g., school closures, caregivers undertaking homeschooling). The deleterious effects of disasters tend to be generally greater for socioeconomically disadvantaged children and families, such as those involved in the child welfare system (Allen et al., 2019; Daughtery & Blome, 2009).

As it relates to the three domains Kousky (2016) proposed, foster children and families during COVID-19 may suffer physical health problems stemming from food insecurity and lack of nutrition. Research indicates that early health shocks are linked with children's delays in motor development, increased behavioral problems, and fewer years of schooling (Victora et al., 2008). In the wake of stay-at-home and lockdown orders, foster children and families may experience greater mental health problems due to increased social isolation and breakdown of everyday social activities (S. J. Lee et al., 2021). Foster children may also be distressed by the limited physical contact they have with their biological parents, siblings, and other family members, as well as witnessing their caregivers' experiences of fear and stress (Kousky, 2016). With many schools going fully remote, most if not all children's education were severely disrupted. Caregivers were placed in positions where they had to bear the burden of homeschooling and supervising children in their care around the clock (S. J. Lee et al., 2020).

5. Current study

The aim of the current study was to examine the concerns most pressing to foster families, including foster parents and former foster youth, during the early months of COVID-19. By collecting baseline data before the pandemic and comparing it with data after the pandemic, the current study examined both quantitative and qualitative changes in foster families' concerns across the two periods. We employed data mining to obtain textual data from Reddit, a publicly available pseudonymous online discussion social media platform. Using a computational social science approach, we combined machine learning techniques for natural language processing with traditional qualitative analytic methods to identify foster families' most common concerns in the form of discussion topics, examine the specific content of such discussions, and how they changed before and after the onset of COVID-19. This study makes an important contribution to the literature by using an innovative data source—social media data from Reddit—less utilized in child welfare research to capture the experiences and voices of foster parents and former foster youth during a public health crisis.

6. Methods

6.1. Data collection

Reddit is a social media platform where members primarily exchange information by uploading texts, weblinks, and images and rating such web content (Reddit, 2019). It is made up of smaller communities called "subreddits" that allow for members to engage in conversations that focus on specific topics of interest. The current study focused on texts from three subreddits—r/fosterit, r/fosterparents, and r/fostercare—where foster families (including prospective, current, past foster families) could submit original posts and comment on existing discussion threads. These three subreddits were identified by searching for foster care subreddits with some of the largest memberships (over 500 members) and most recent activities (online post uploaded in the last 24 h). Membership sizes for these subreddits ranged from moderate to high (between 975 and 8700 members) and their most recent posts occurred within the last 8 h. Textual data from these three subreddits were collected using the Pushshift Reddit Application Programming Interface (API)

(Baumgartner et al., 2020). Data collection occurred between January 1 and May 23, 2020, which allowed for sufficient time between before and after COVID-19 occurred. We used March 11, 2020 as the pandemic onset date, as it represented the date when COVID-19 was officially declared as a global pandemic by the World Health Organization (WHO) (2020). A total of 896 full conversation threads were obtained, which equated to 11,830 Reddit comments by 1739 unique users. Comments averaged 79 words. The Institutional Review Board (IRB) at the University of Michigan determined that the study does not require IRB oversight given the publicly available nature of the data.

7. Analytic plan

7.1. Topic modeling: Latent Dirichlet Allocation

We used Latent Dirichlet Allocation (LDA) (Blei et al., 2010), an unsupervised machine learning tool that identifies latent topics from a large corpus of textual data. This LDA topic modeling approach produces a set of keywords known as Lexical Groups (LG) that accompany each topic. We trained the LDA models on the aggregate set of comments from all three subreddits and with the topics' *k* value ranging from 10 to 20 to find the optimal number of topics. For each of these *k* iterations, we calculated the coherence of the LDA models. Coherence scores were subsequently produced for each *k* topic model, indicating how coherent the topics were within each model (i.e., keywords of the topics are highly related or cohere to each other) (Syed & Spruit, 2017). LDA models with higher coherence scores better approximate human ratings and suggest that the topics are more distinguishable (i.e., highly interpretable) from one another than topic models with lower coherence scores (Syed & Spruit, 2017).

7.2. Doc2Vec

Although LDA produces a list of topics, it does not account for the semantics of the document because the word order is not preserved. Doc2Vec allows us to determine how the same words are used in different documents (Le & Mikolov, 2014). Simply put, Doc2Vec produces terms that serve as contextual words, allowing researchers to better understand the context in which a target word occurs. We used Doc2Vec to find context words associated with each of the LDA topics.

7.3. Log Likelihood Ratio

Log Likelihood Ratio (LLR) was used to distinguish the words that define conversations within each topic before and after COVID-19 (Dunning, 1993). A positive and large LLR value indicates that the term was more likely to appear in discussions after the COVID-19 onset than before it, whereas a negative and small LLR value indicates the inverse pattern. A value close to zero means that the word was equally likely to occur in discussions before and after COVID-19. Because LLR can be unreliable with rare word occurrences (Moore, 2004), we only used words that appeared at least 10 times in each of the documents used in our analyses.

7.4. Modeling differences before and after COVID-19

We calculated the rolling average for each of the topics throughout the examined time period to determine how different topics trended before and after the COVID-19 onset. As noted above, we used March 11, 2020 as our cutoff point as it represented when the WHO declared COVID-19 as a global pandemic. We used the Chow *F*-test (Wooldridge, 2009) to test statistically significant structural differences between before and after COVID-19 topics.

7.5. Qualitative coding

Qualitative analysis of the text data involved two independent coders, namely the first and second authors. To determine the names of the topics the LDA model generated, the coding team used Python to sample 20% of the Reddit comments, which is consistent with prior research examining textual data from social media (J. Y. Lee, Grogan-Kaylor, et al., 2020; Lyles et al., 2013). This involved sampling 100 comments from each of the identified topics. The coding process occurred in an iterative fashion with multiple rounds. The first round focused on the first 25 comments for each topic. The coders independently read all generated comments, while taking detailed notes in separate Google Spreadsheets about which theme emerged within each topic that best captured the topic. The coders then met together to compare notes and results to develop an initial code book.

The second round involved independently reading the next 50 comments for each topic and testing the applicability of the initial code book. Again, the coders met to compare notes and results and discussed any necessary changes to the code book. The final round entailed independently reading the last 25 comments for each topic and discussing any additional changes to the code book. For all three rounds of coding, extensive discussions, along with LG and Doc2Vec results serving as helpful guides, were used to resolve any disagreements, and thus, the two coders were able to reach consensus on all topic names. In total, the coders independently read and discussed the results of 1400 comments (14 topics × 100 comments). The interrater reliability reached 85.71% agreement with a Cohen's kappa of 0.85, indicating strong interrater reliability that corresponds to 64–81% of the data being reliable (McHugh, 2012).

A similar approach was utilized for comparing the content of Reddit comments before and after the COVID-19 onset. Once more, 100 comments for each topic were sampled using Python but this time for both time periods by setting time = "pre-COVID" or "post-COVID". This generated a total of 2800 comments (14 topics × 100 comments × 2 timepoints). Once more, the first and second authors

engaged in coding in an iterative fashion, independently reading the comments in large chunks, observing any notable qualitative changes and recording them in detail using separate Google spreadsheets, and then meeting to discuss where they agreed or disagreed on important changes in comments occurring before and after the COVID-19 onset for each topic. Challenges with understanding the meaning of some of the contents involved pulling and reading full conversation threads. LLR results, as well as full threads, served as helpful guides as the two coders reached consensus on meaningful qualitative changes in the topics. Throughout the coding process, the two coders identified, highlighted, and extracted example quotes that best represented the topics and their contents. Consistent with prior recommendations (Bruckman, 2002), example quotes were modified enough so that Reddit users could not be identified but also without changing their core messages.

8. Results

### 8.1. Topic modeling of foster families' subreddit texts

A total of 14 topics emerged from the final LDA model, which used aggregate data across all timepoints. The highest coherence score was for the LDA model with $k = 14$ topics (for details, see Supplementary Material S1). By default, Python generates topics starting from 0 and thus the 14 topics ranged from 0 to 13. Based on qualitative coding, the 14 topics were labeled: Topics 0 *Pets*, 1 *Communication with child welfare system*, 2 *Needs of foster children*, 3 *Becoming a foster parent*, 4 *Child behaviors*, 5 *Infant care*, 6 *Permanency*, 7 *Lice removal*, 8 *Biological parents*, 9 *Activities for foster children*, 10 *Food and nutrition*, 11 *Discrimination*, 12 *Safety plan*, and 13 *Money* (see Supplementary Material S2, which includes additional details such as LG topic terms, Doc2Vec context terms, content summary, and example quotes).

As shown in Fig. 1, comments involving Topic 6 *Permanency* (31%, $n = 4078$ comments) were most common, followed by those for Topics 4 *Child behaviors* (18%), 2 *Needs of foster children* (18%), 11 *Discrimination* (10%), 1 *Communication with child welfare system* (7%), 3 *Becoming a foster parent*, (5%), and 10 *Food and nutrition* (2%). All remaining topics had comments which made up 1% or less than 1% of the sample. These included Topics 13 *Money*, 0 *Pets*, 9 *Activities for foster children*, 8 *Biological parents*, 12 *Safety plan*, 7 *Lice removal*, and 5 *Infant care*.

8.2. Subanalysis of former foster youth's topics

We also conducted a subsample analysis of Reddit comments by former foster youth. To do so, we gathered statements identifying oneself as a former foster youth (e.g., "Former foster youth here," "Growing up in foster care") in the analytic texts. A total of 65 unique users (4% of the larger sample) self-identified as former foster youth. Of the 14 topics, we examined topics most salient to former foster youth that may be distinct from the larger corpus of comments by foster families. Although a small sample, this importantly allowed us to directly examine concerns most pressing to individuals with histories of foster care involvement. Four topics emerged for former foster youth and included Topics 2 *Needs of foster children*, 4 *Child behaviors*, 6 *Permanency*, and 11 *Discrimination*.

As shown in Table 1, topic 2 *Needs of foster children* involved former foster youths' experiences of being unwanted by their foster families and necessary resources and support for those aging out. Topic 4 *Child behaviors* focused on experiences of past behavior problems and perceptions of foster parents' parenting behaviors. Topic 6 *Permanency* involved former foster youths' permanency experiences, including adoption and aging out of foster care. Finally, topic 11 *Discrimination* involved a range of experiences pertaining to bias and discrimination, including favoritism in foster homes and the need to pay more attention to foster youth in transition. See Table 1 for additional details, including example quotes from former foster youth. Additional quotes of former foster youth are also provided as part of Supplementary Material S3.
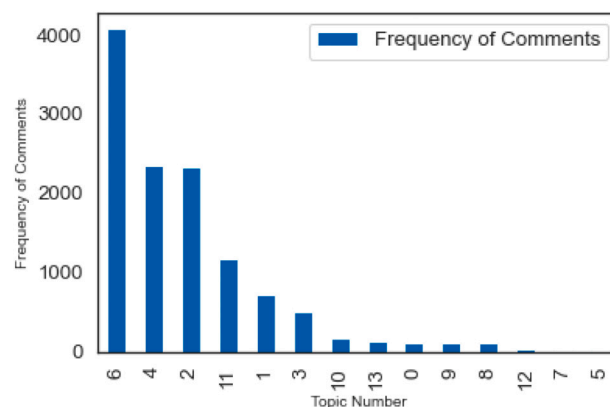
Fig. 1. Most frequent comments by topics. Topic 6: *Permanency*. Topic 4: *Child behaviors*. Topic 2: *Needs of foster children*. Topic 11: *Discrimination*. Topic 1: *Communication with child welfare system*. Topic 3: *Becoming a foster parent*. Topic 10: *Food and nutrition*. Topic 13: *Money*. Topic 0: *Pets*. Topic 9: *Activities for foster children*. Topic 8: *Biological parents*. Topic 12: *Safety plan*. Topic 7: *Lice removal*. Topic 5: *Infant care*.

Table 1

Topics emerged from Reddit comments of self-identifying former foster youth.

Topic #	Topic name	Topic summary	Example quote
2	Needs of foster children	Experiences of being unwanted by foster family Allowing freedom and space for foster youth to figure out their paths Need for resources and support after youth age out of foster care	"As a former foster youth, I could always tell when my foster parent wasn't feeling it and didn't want me there. The parent made every gesture, including every word out of their mouth, feel empty and fake." "I was in foster care and bounced around. Foster parents often think they know, but they have no clue. The independent living doesn't help us during college year like it ought to. We really have no one to help us after we age out of foster care. We get thrown to the wolves."
4	Child behavior	Experiences of past behavior problems and suggestions for current foster parents Perceptions of discipline strategies used by foster parents to elicit compliance from foster children Forced to attend church and challenging parents' savior complex	"I was a former foster youth my entire life and I think a rule board is really scary for children. I know that breaking rules terrified me." "I was in foster care for a decade and aged out at the age of 19. I was in a Christian home and the foster mom forced me to go to church. I did, but in rebellion I wore all black. I also made my foster mom cry by telling her that God didn't really exist because if He did, then my parents wouldn't have left me and that she lived with this privileged view that she could be my savior."
6	Permanency	Adoption experience Long-term relationship with foster parents Kinship foster care Aging out experience	"I am adopted and the day I finally came to my adoptive parents was dubbed my 'best day.' Every year, we celebrated it with a special dinner. My mom will still call every December 6th to wish me happy 'best day.'" "I still talk to my previous child welfare workers and foster parents. My biological mom never did what she was supposed to, so I ended up aging out of foster care and built relationships with those who stepped in her place."
11	Discrimination	Favoritism in foster homes Support needed for foster youth who age out of care	"I was treated so terribly because I wasn't a biological [child]. My foster mom so blatantly favored her biological children over me that she never should've f***ing fostered. I eventually aged out. Help, because the rest of us former foster youth are adults now still without resources family or support."

Note. Brackets were added in some of the example quotes to provide further clarification.
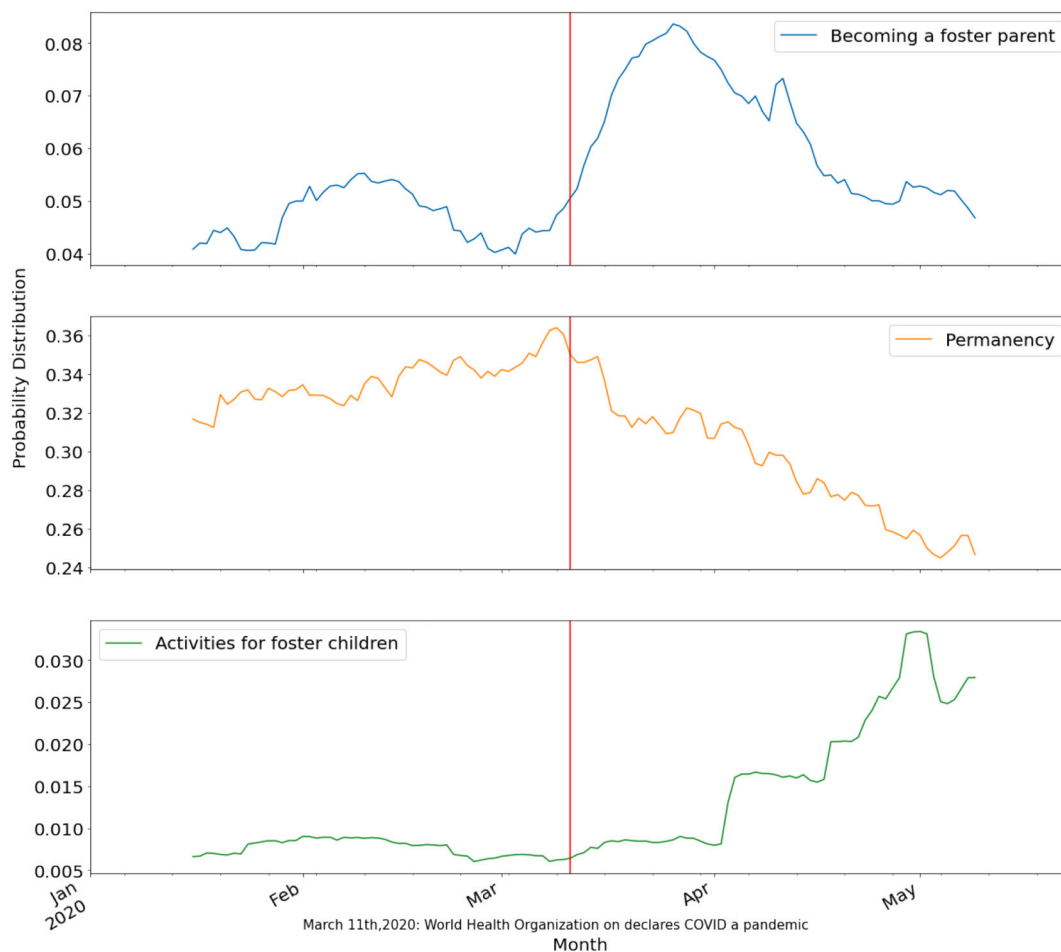
Fig. 2. Graphs of main topics, which had significant structural differences between before and after COVID-19. The red line indicates when the World Health Organization officially announced COVID-19 as a global pandemic on March 11, 2020. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

9. Before and after COVID-19 discussion topic comparisons

9.1. Log Likelihood Ratio

LLR results showed which terms most commonly appeared before and after COVID-19. Note that the terms are stem words, meaning that the original words were reduced to their stem or root form for analytic purposes. Before COVID-19, the 10 most common terms were: "foster" (LLR = −60.23), "adopt" (LLR = −60.16), "need" (LLR = −50.37), "money" (LLR = −45.31), "ffi" (LLR = −43.14), "post" (LLR = −37.74), "goal" (LLR = −35.65), "desir" (LLR = −34.14), "that" (LLR = − 30.18), and "dont" (LLR = −29.67). These suggest that conversation around fostering, adoption, and financial needs were common before COVID-19 occurred. After the COVID-19 onset, the 10 most common terms were: "covid" (LLR = 111.65), "quarantin" (LLR = 98.77), "pandem" (LLR = 77.30), "video" (LLR = 69.71), "food" (LLR = 58.50), "visit" (LLR = 58.34), "virus" (LLR = 50.10), "dungeon" (LLR = 44.37), "zoom" (LLR = 41.51), and "book" (LLR = 37.31). These suggest that conversations centering the pandemic, quarantine measures, virtual video visits, and food needs were common after COVID-19 occurred. Importantly, these LLR results showed that there was a noticeable change between the two timepoints.

9.2. Main topics of interest

All 14 topics were modeled over January to May 2020, and the Chow *F*-test was applied to examine significant changes between before and after COVID-19 (for details, see Supplemental Material S4). Results of the Chow *F*-test specifically showed that there were significantly different changes across the two time points for three topics as shown in Fig. 2. There were significant increases in topics 3 *Becoming a foster parent* ($F = 5.75$, $p = 0.02$) and 9 *Activities for foster children* ($F = 10.61$, $p = 0.001$), whereas there was a significant decrease in topic 6 *Permanency* ($F = 9.46$, $p = 0.003$) before and after the onset of COVID-19. These served as our main topics. Again, as

Table 2
Main topics and their content before and after COVID-19 was declared as a pandemic.

Topic #	Topic name	LLR word (value)	Pre-COVID topic summary	Example quote	LLR word (value)	Post-COVID topic summary	Example quote
3	Becoming a foster parent	interview (−17.62) orient (−15.04) good (−12.83) yet (−12.35) paperwork (−9.03)	Approval of foster care licensure Completion of licensure requirements Anxious or annoyed about slow licensure process	"I was approved this evening! 2 h later I got a call. I said I'd take the children. I hope I'm ready!" "I'm still waiting to finalize my licensing case and a bit annoyed. I had the second home visit and was surprised, given another whole stack of paperwork to finish. This is pretty redundant to what I already completed. I feel like it's going to be another month before everything is complete, which is way beyond what I originally estimated. Smh."	virtual (30.18) covid (23.71) zoom (17.25) video (16.34) visit (16.32)	Anxious about additional delays in licensing Frustration over postponed foster parent training classes Licensure process going all online	"I started classes, but everything keeps getting rescheduled or canceled. I was supposed to have a home visit today but the worker canceled. I'm increasingly anxious. I know why we're taking precautions, but at the same time, a lot of kids are going to come into care as a result of the same pandemic that is stopping families from moving forward with licensing. I want to help by being a resource, but everything is at a standstill."
6	Permanency	adopt (−30.83) attach (−27.97) goal (−23.74) move (−10.42) stabil (−7.03)	Best interest of the child Adoption intention, goal, or experience Reunification between foster children and biological family	"I'd love to adopt, but I'm open to what's best for the child. The goal is to have children reunited with their biological family." "Do I get attached to the children? Of course! But, I don't know how to love these kids with less than all that I have. When they return home, it does break my heart. Some will tell you that you should rejoice when they leave, but I'm not some. I feel both the loss of a beautiful child and hope that their biological family has healed and will stay together. Eventually, I put my heart back together, take some time off to recuperate, and then open my home again."	quarantine (20.66) youngest (16.73) covid (14.47) birth (11.01) figure (10.95)	Pursuing adoption or legal guardianship Termination of parental rights related to children's age Ongoing family separation between foster children and their biological families Pandemic-specific challenges as waiting for permanency	"18 months later, foster daughter is still here and so is her 6-month-old sister. Hopefully I can begin the process to become their legal guardian after this COVID-19 mess is over!" "Foster kids are far away from their biological mothers, fathers, siblings, and homes during this pandemic." "I'm less than a year into being a foster parent, and I'm already feeling burnt out. I took a rough placement, and now with the addition of quarantine and taking on pretty much homeschooling, I feel completely lost. I hope no matter what, my foster daughter ends up a bit better off by being a part of my family for however long she's with us. I hope she can look back at this time as something positive."
9	Activities for foster children	bond (−20.44) thank (−16.88) phone (−12.86) agree (−8.68) show (−8.05)	Ideas for everyday activities and projects Suggestions for activities to address sensory-related behavior Activities to help connect with foster children	"What activities does your foster son enjoy doing with you? What makes him smile and laugh? Do those things if he is up for it. They might include board games, card games, word games, etc. Is there something he does really well that you'd like to learn? If so, I bet he'd love to teach it to you. For instance, if he likes to cook, ask him to teach you a favorite recipe. These are things you'll learn about him, bond over together, and remember him by."	fun (20.73) gift (17.70) allow (11.16) time (9.19) graphic (8.77)	Specific activities to do during lockdown and quarantine Gifts and attention to foster children Scheduling time to do activities together	"We would have a much harder time surviving this [pandemic] without a small indoor exercise trampoline. It was only $20!" "We are going to have a 'prom' at home. We'll dress up, make punch, have a dance party. Lol." "My foster kids and I have scheduled time together. Both of them dislike reading, so we're taking this time to go back to square one. I'm reading to them books that I think they'll like (starting with Narnia). We also have 'our' show that we all watch and have commentary together (currently Teen Wolf). We also FaceTime with siblings. Home workouts are on the table, but I haven't had any takers yet!"

Note. LLR = Log Likelihood Ratio. Negative LLR values corresponds with words that most commonly appear before COVID-19. Positive LLR values corresponds with words that most commonly appear after COVID-19. LLR words represent stemmed words. Brackets were added in some of the example quotes to provide further clarification.

depicted in Fig. 2, topics 3 and 9 were on an upward trend while topic 6 was on a downward trend after the onset of COVID-19.

Qualitative coding of comments from these three topics also showed meaningful qualitative differences between before and after COVID-19 occurred as shown in Table 2. For topic 3 *Becoming a parent,* excitements over approval of foster care license and completion of licensure requirements were predominantly present before COVID-19. After the COVID-19 onset, the topic primarily involved prospective foster families' comments related to increasing anxieties about delays in their licensing cases, as well as frustrations around postponement of foster parent training classes. For topic 6 *Permanency,* content related to the best interest of the child, adoption goals, and reunifications between foster children and their biological parents were the main focus before COVID-19. After the COVID-19 onset, the topic content changed to concerns over ongoing family separations between foster children and their biological families, as well as pandemic-related challenges as foster children were waiting on permanency. For topic 9 *Activities for foster children,* general content related to ideas for everyday activities and projects was present before COVID-19. After the COVID-19 onset, the topic specifically focused on activities foster children and families could do during lockdowns and quarantines. Additional quotes pertaining to these main topics can be found in Supplementary Material S5.

9.3. Additional topics of interest

In addition to the three main topics, we examined additional topics that provided additionally interesting insights in terms of changes (or lack thereof) between before and after COVID-19. These topics did not exhibit significantly different quantitative changes. Of the remaining 11 topics, six topics showed interesting patterns, as well as notable qualitative changes in the content being discussed across the two time points. This included Topics 1 *Communication with child welfare system,* 4 *Child behaviors,* 8 *Biological parents,* 10 *Food and nutrition,* 12 *Safety plan,* and 13 *Money* (see Supplementary Material S6 for details).

Before COVID-19, topic 1 *Communication with child welfare system* content involved difficulties reaching child welfare staff and filing related complaints. After the COVID-19 onset, the topic changed to specifically involve comments about the child welfare system scrambling to manage COVID-19 and already limited contacts with child welfare professionals being exacerbated by the pandemic. Before COVID-19, topic 4 *Child behaviors* content involved children's adjustments to new foster homes and general behavioral challenges. After the COVID-19 onset, the topic primarily focused on behaviors foster children exhibited during the pandemic and ideas for supporting children's coping. Before COVID-19, topic 8 *Biological parents* focused on birth parents' attendance at court proceedings and foster children's safety when with their biological parents. After the COVID-19 onset, the topic content centered on virtual visitations between foster children and biological parents and foster parents' concerns of exposure to COVID-19 upon in-person visits foster children had with biological family members who tested COVID-19 positive.

Before COVID-19, topic 10 *Food and nutrition* content focused on ideas for introducing healthy food and eating habits for foster children. After the COVID-19 onset, the content revolved around foster children's holding of foods in their mouths for long periods of time, schools' distributions of meals, and foster parents' anxieties over securing enough food during the pandemic. Before COVID-19, topic 12 *Safety plan* content involved comments related to protecting Indigenous children through legislation such as the Indian Child Welfare Act and procedures in place to review foster homes with alleged maltreated cases. After the COVID-19 onset, the topic focused on lack of funding in the child welfare system to protect and support maltreated children in the pandemic and school being a protective factor for children. Finally, before COVID-19, topic 13 *Money* focused on content about funding child welfare agencies affiliated with a religion and foster parents claiming children in their care on their tax returns. After the COVID-19 onset, the topic, while still focusing on claiming foster children on tax returns, included content related to the COVID-19 stimulus checks (e.g., whether foster parents get an extra $500 for children in their care) among other comments (see Supplementary Material S7 for details).

10. Discussion

This study used Reddit data to explore the most pressing concerns of foster families during the early months of COVID-19 by comparing relevant topics before and after the pandemic officially began. By using natural language processing approaches combined with traditional qualitative methodology, the current study makes an important contribution to the child welfare literature. It was able to leverage publicly available social media data to directly capture foster parents' and former foster youth's pandemic experiences when most research institutions experienced stops in human subjects studies and the child welfare workforce had limited contacts with foster families during early parts of COVID-19. Although not a representative sample, the data give researchers a valuable window into how foster families are navigating the pandemic and subsequent adjustments of foster children.

Foster families discussed a range of topics from pets in foster homes to financial matters. Permanency, child behaviors, needs of foster children, and discrimination (e.g., lack of attention paid to foster youth aging out of care) were some of the most common discussion topics among former foster youth. Significant quantitative and meaningful qualitative changes were found for three key topics—becoming a foster parent, permanency, and activities for children—between before and after the COVID-19 onset. Importantly, these findings can be understood through the lens of Kousky's (2016) theorization of natural disasters' impacts on children's and their families' physical health, mental health, and education. Complaints related to delays in foster home licensure significantly increased after COVID-19 occurred and was exacerbated by additional postponements of home studies and cancellations of licensing classes. This speaks to creating a robust safety net for children and families in times of disaster (Kousky, 2016), including ensuring that sufficient numbers of quality foster homes are available to care for and protect children and flexibly responding to the different array of foster families' needs during and after COVID-19 (Dodge, 2021).

Conversations around permanency significantly decreased during COVID-19 and foster families expressed their concerns of ongoing family separations between foster children and their biological family members. Research has shown that being continued to

be displaced in the aftermath of a natural disaster is linked with symptoms of post-traumatic stress disorder (Lonigan et al., 1994; Oskofsky et al., 2009). Even in non-disaster times, it is well-documented that forced separation of children from their families is linked with trauma, behavior problems, cognitive delays, depression, and poor educational outcomes (Adam & Chase-Lansdale, 2002; Howard et al., 2011). Among some of the most helpful interventions shown to be effective in the aftermath of a disaster includes reuniting children with their families, especially parents or primary caregivers, as quickly as possible to buffer against disaster-related traumas and exposure to child maltreatment (Kousky, 2016). Results from this study highlight the importance of prioritizing permanency during COVID-19 and pursuing safe ways to reunite foster children with their biological parents, siblings, and other family members. Importantly, the results also speak to the increasing awareness about the harms of family separation in the broader field of child welfare (Dettlaff et al., 2020; Sankaran et al., 2019). Foster parents seem to be having related conversations on Reddit and are becoming aware of the negative impacts that family separation may be having on foster children and youth.

Discussions concerning activities for foster children significantly increased during COVID-19. Foster parents asked for and shared activity ideas for their foster children to do during lockdowns, especially as they were being tasked with supervising and homeschooling their foster children around the clock. Research on children's schooling after a natural disaster, such as Hurricane Katrina, has shown that disruptions to education can happen on a wide scale, with close to 200,000 public school students in Louisiana changing schools and many of these students missing school for a month or longer (Kousky, 2016; Pane et al., 2008). COVID-19 has been with us for over a full year now, with many schools fully transitioned to remote learning and devising safety plans for reopening in the new academic year. Emerging research estimating the impact of school closures on children's education shows that COVID-19related shutdowns are likely to widen the achievement gap (Dorn et al., 2020). The loss of learning is expected to be the greatest for Black and Brown students from socioeconomically disadvantaged backgrounds, many of whom are overrepresented in the foster care system (Dorn et al., 2020). Additionally, research showing 40% of parents meeting criteria for major depression and severe anxiety in the context of homeschooling their children (S. J. Lee et al., 2020) suggests that foster parents also are likely experiencing mental health issues and stressors around the education and supervision of children in their care.

Our additional findings showed that challenges arose with communicating with case workers and supervisors as child welfare offices were closing and going online in the early months of COVID-19, adding to the stress foster parents were likely experiencing as a result of lack of guidance and support from the child welfare system (Homan, 2020; Kousky, 2016). Foster parents also reported behavior problems children in their care experienced (e.g., wetting bed) that were specifically linked with COVID-19 lockdowns, which is consistent with emerging findings of parents reporting changes in child behaviors since the pandemic started (S. J. Lee et al., 2020). This is also related to children's educational disruptions during disasters to which Kousky (2016) referred. Reports have noted challenges of homeschooling for foster parents, including children's tantrums, worries over slow academic growth, lack of social interaction with peers, and struggles over creating a sense of security and normalcy in uncertain times (Conn, 2020). Conversations involving food and nutrition, especially concerns over food insecurity and growing anxieties over limited food supplies, speak to COVID-19's potential impact on the physical wellbeing of foster children and their caregivers (Kousky, 2016). Food hoarding was common in the early months of the pandemic (Zhang et al., 2020), causing stress for many foster parents, including grandfamilies and kinship families, that they may not be able to provide adequate food and nutrition for children in their care (Generations United, 2020). With recent surges in COVID-19 cases, food hoarding and anxieties around it may appear once more as families anticipate additional waves or variants of the virus (Zhang et al., 2020).

11. Implications for child welfare practice and policy to support foster families during and after the COVID-19 pandemic

Permanency should still be the priority during COVID-19 while ensuring the safety of all those involved. For example, child welfare officials should quickly but safely reunite children with their biological parents or primary caregivers and make sure adequate supplies of personal protective equipment are available to the child welfare workforce facilitating the reunification process (Children's Bureau, 2020). The State of Michigan's "Rapid Permanency" strategy serves as a case in point [Michigan Department of Health and Human Services (MDHHS), 2020]. This strategy involves a team approach with child welfare caseworkers, lawyers, and judges working together to analyze cases eligible for reunification and devise a plan, with the input from parents, for safe and expedited permanency during COVID-19. Virtual court hearings and immediate referrals to resources and services are also being used to remove barriers and to reunite foster children with their biological parents during this time (MDHHS, 2020). Another related implication is foster parents' education on the harms of family separation. Foster parents in this study already were having conversations about the ongoing separations between foster children and their biological families during COVID-19. Formally equipping foster parents with research knowledge of the negative effects of family separation on children not only aligns with current trends in the broader field of child welfare, but also allows for recruiting foster parents' support in reunifying foster children with their families during and after COVID-19.

To help address foster children's behavior problems and specific needs of former foster youth, it is recommended that child welfare system leverage online (e.g., Zoom) and mobile technologies (e.g., text messages, phone apps) to improve communication, contacts, and consultations with foster parents and former foster youth to address their unique needs during the pandemic. For example, adopting what home visitors are currently doing, child welfare workers can use Zoom calls and text message based questions to assess needs, conduct home visits, share resources, and lend social support (Supplee & Crowne, 2020). Florida has successfully used Zoom calls to certify foster homes, deliver parenting courses, and conduct "visits" by social workers (Dodge, 2021). That said, there is a lack of uniformity across child welfare systems in their uptake of technology, contributing to pandemic responses that vary from state to state (Dodge, 2021). It will be important for child welfare systems to build their capacities to quickly adapt to technology and be nimble in delivering services and resources to all foster families.

For foster parents specifically, parent education materials can be shared virtually. These include those child welfare workers have used in person for almost a decade (e.g., help foster parents identify one behavior that is most troublesome and make a plan to redirect the behavior using rewards or targeted intervention) (Conn, 2020). Additional tips child welfare workers can virtually share with foster families include reassuring foster children; supporting their connection with biological parents, siblings, friends, caseworkers, and other advocates; conducting visitations outdoors or virtually; and creating a safe environment by minimizing the additional stress and isolation foster children may experience (Waite & Partap, 2020). As online schooling has become the new normal, it will be imperative to ensure foster children and their caregivers have access to technological devices and services, including laptops and high speed internet.

At the policy level, there is a critical need to strengthen existing safety net programs for foster families, such as supplementing and supporting their incomes to alleviate risks of child maltreatment (Conrad-Hiebner & Byram, 2020). As part of the Families First Prevention Services Act (2018), the Prevention Services Clearinghouse was established which conducts rigorous reviews of interventions supporting children and families. The Clearinghouse suggests promising interventions for foster families, and two of them include the *Homebuilders: Intensive Family Preservation and Reunification Services* and *Multisystemic Therapy*. The interventions focus on cultivating skills and strategies to support permanency (i.e., family reunification), as well as promote the health and psychological wellbeing of foster youth. Finding creative ways to implement these interventions may alleviate the effects of heightened levels of COVID-19 related adversities on foster families' wellbeing.

Finally, in August 2020, a bipartisan bill, Supporting Foster Youth and Families Through the Pandemic Act (2020) (HR 7947), was introduced in Congress to help address the negative economic effects of COVID-19 on current foster children, families, and foster youth who aged out of the system. It was signed into law December 27, 2020. As suggested by findings from the current study and prior research (Dodge, 2021; Wong et al., 2020), there is an immense need to support former foster youth during the pandemic as they are experiencing difficulties related to accessing stable housing, employment, education, and health and mental health services (Wong et al., 2020). Former foster youth are in need of cash assistance in particular but may not be eligible for the COVID-19 stimulus checks or unemployment benefits. The Supporting Foster Youth and Families through the Pandemic Act would help make such cash assistance available to foster youth, as well as appropriating additional funds for the Chafee and its Education and Training voucher programs, temporarily pausing foster children's aging out, and allowing former foster youth to re-enter foster care voluntarily. It will be important for the federal and state governments to act creatively and swiftly to ensure foster and former foster youth have relevant information about services available to them and receive cash and other assistance (e.g., educational, health, career and employment related) in a timely manner to sufficiently meet their needs as the COVID-19 pandemic continues on.

12. Limitations

The current study has several limitations. Due to the pseudonymous nature of Reddit, we could not obtain and analyze important sociodemographic information of foster families. That said, the pseudonymity of the platform may have also allowed users to discuss topics that they otherwise might find stigmatizing (Ammari et al., 2018). Given that data collection ended on May 23 of 2020, we were unable to capture racial justice-related content in the aftermath of George Floyd's death, which occurred just two days later and most likely would have resulted in a large spike in discussions about discrimination and systemic racism. Nonetheless, comments from the current study importantly speak to the discriminatory and prejudiced experiences foster children and youth face. Additional data collection is warranted to further shed light on how foster parents and children are coping in the face of recurring acts of racial injustices during the pandemic. Another limitation is the lack of generalizability of the findings to other foster families, as we were only able to capture the comments from foster families with access to Reddit and its foster subreddit communities. This is likely to leave out some of the most vulnerable groups of foster families. Representative samples are needed although our current approach served as an innovative alternative to traditional research methods during COVID-19.

13. Conclusion

The current study leveraged publicly available social media data from Reddit to better understand the concerns most relevant to foster families during the early months of the COVID-19 pandemic. Foster families expressed their worries concerning delays in their licensing cases and concerns over the permanency plans of children in their care, activities to help keep foster children occupied during stay-at-home orders, and exacerbated child behavior problems among others. These results suggest areas where child welfare professionals may need to intervene to support foster families during and in the aftermath of the pandemic.

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