Overlooked Voices under Strict Lockdown: Mapping Humanitarian Needs in 2022 Shanghai COVID-19 Outbreak

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Introduction

The COVID-19 pandemic has been around for almost three years since the initial outbreak in Wuhan, China, in early January 2020. Living with COVID-19 has become a new normal in the whole world. Different nations published divergent policies against the pandemic. A substantial number of nations rely on vaccination and improved treatment to achieve herd immunity, while developing countries with high population density like China stick to the zero-covid strategy, one of the strictest policies against COVID-19. Besides travel limitations and mass testing of the entire population, cities in China implemented strict lockdown policies when the number of active cases passed a threshold (Song, 2022).

Such a stringent strategy is a double-edged sword. It has been proved that lockdown leads to an instant decrease in the growth rate of infected cases (Lau et al., 2020) while causing severe shocks to society, economy, and financial markets (Luo and Tsang, 2020; Liu, 2021). Research has been conducted to scrutinize the side effects of the lockdown policy regarding mental health (Qiu et al., 2020; Paltrinieri et al.,2021), challenge to higher education (Tesgay et al., 2022), impact on sustainability (Manenti et al., 2020; Shammi et al., 2021; Chowdhury et al., 2021) and so forth. However, very few of them focus on the humanitarian needs of the residents, especially during the starting phase.

Starting from the end of March 2022, one of the largest cities in China, Shanghai, launched a city-wide lockdown after a surge of positive COVID cases was reported (Galbraith and Stanway, 2022). Even with the experience gained from several forerunners, including the city of Wuhan, Shijiazhuang, and Xi'an, the Shanghai lockdown brought about unforeseen issues for its residents. People posted help requests on mutual-help platforms and social media chat groups (Reuters, 2022).

This paper focuses on unveiling the overlooked humanitarian help requests during the lockdown phase of Shanghai by harvesting data from an online mutual-help platform and spatial-temporal analysis. The results will provide timely feedback to the government and decision-makers to properly handle lockdown-triggered societal challenges. The findings of the paper will formulate valuable insights and guidelines for other cities that might undergo lockdown in the future.

Method

Data Collection and Processing

The humanitarian help requests data are harvested from a website named "Let us help you" developed and maintained by a non-profit organization called Daohouer (https://daohouer.com/index.php?page=1&hdid=&cjtype=&address=#). The website is currently discontinued due to the termination of Shanghai lockdown. The data collection and processing workflow is depicted in Figure 1.
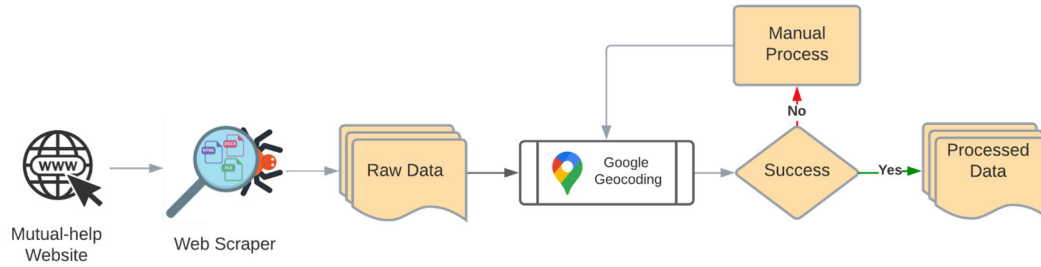

Figure 1: Data collection and preprocessing workflow.

A web scraper was developed to scrape data from the mutual-help website based on its HTML content structure. The raw data contains District information, help request abstract and detail, urgency level, and category. A proportion of help requests had more precise addresses and were fed to the Google geocoding service. If one record was not successfully geocoded, a manual process was involved in modifying the address so the geocoding service could function correctly. For example, some addresses mentioned in the help requests are names of hotels and null results will be returned if they are fed to Google geocoding service without processing. Therefore, we manually searched the exact addresses of those hotels with a Chinses map web application, Baidu Map and the addresses were input to the Google geocoding service instead of the original hotel names. Once the geocoding process was finished, the precise coordinates were assigned to the original data. After the automated geocoding and manual modification, 4396 help request records were gathered (Figure 2). Among them, 1805 (41.1%) are geocoded with more precise geographical coordinates such as position of POIs or centers of bounding boxes, while 2591 (58.9%) are tagged with only District information. The 2018 China census data were also used to normalize the counts of help requests at the District level.
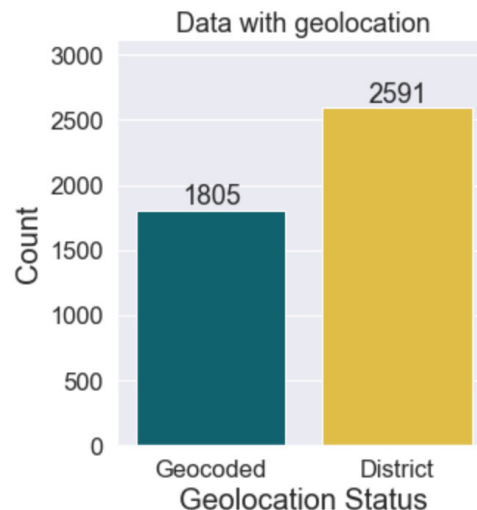
Figure 2: Geolocated data distribution.

Spatiotemporal Analysis

The dataset was categorized into several groups according to the urgency (extremely urgent, urgent, and normal) and the category of the help reported (disease, serious disease, supply and others). First, the spatial distribution of the geolocated tweets was visualized. Second, the count of help requests in each administrative division was calculated and displayed after performing spatial join on the entire dataset and Shanghai district shapefile. The join counts were then normalized with the population of each district. Next, the temporal patterns were visualized for each category of the dataset. Finally, we developed an interactive online dashboard to provide a real-time visualization of the data harvested.

Results

Spatial Analysis

The data distributions under each category are shown in Figure 3 (a) and (b). From Figure 3, we can claim that the majority (60.3%) of the help requests are reported as extremely urgent. Disease and lack of supplies are the leading causes of people requesting help online.
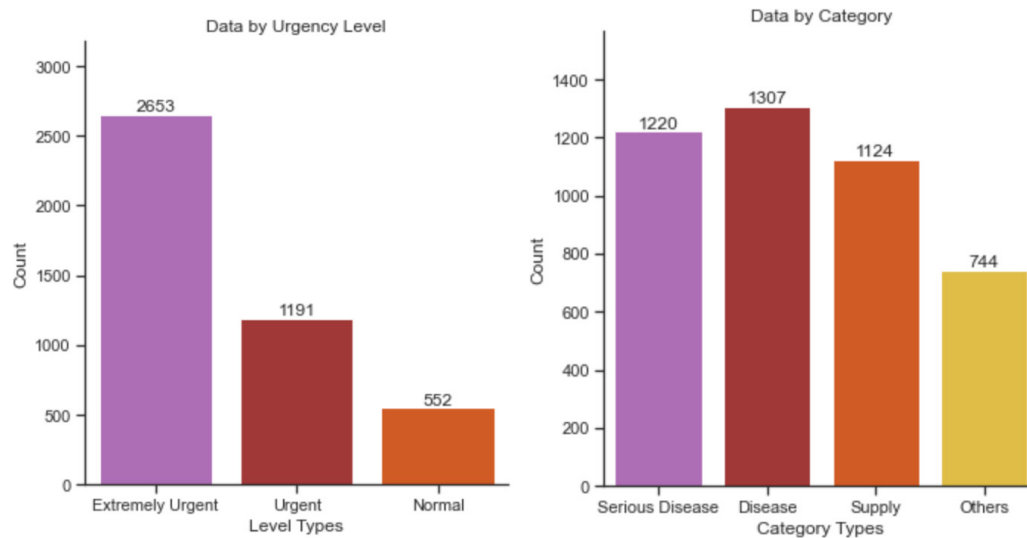
(a) Data distribution by urgency level   (b) Data distribution by category

Figure 3: Data distributions by urgency level and category

Figure 4 displays the distributions of help requests by urgency level and category in Shanghai. It reveals that help requests are spread across the metropolitan area and clustered in downtown Shanghai.
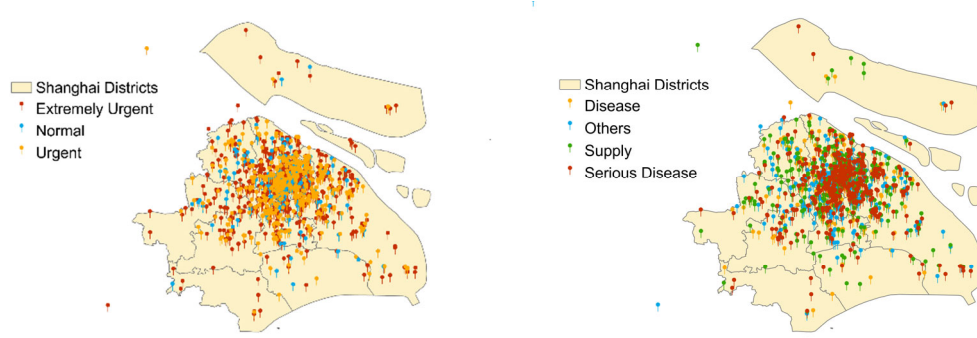
Figure 4: Location visualization by urgency level and category.

To better observe the spatial distribution, a feature join method is performed on the "district" value of the pre-processed data and the administrative division data of Shanghai. The results are shown in Figure 5 (a). Pudong, Minhang, and Baoshan are the top 3 Districts with the highest amount of help requests, indicating that these districts require the most resources. These three Districts are close to downtown Shanghai and are relatively larger in size than most other Districts, so the larger number of help requests may be caused by a larger population.
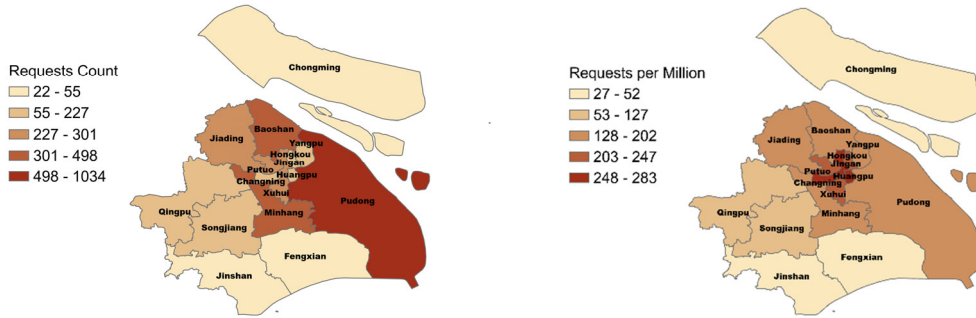
(a) Number of help requests   (b) Scaled number of help requests

Figure 5: Help requests at District level.

To tackle the population bias and gain a deeper insight of the impact of the lockdown policy to each district, the number of help requests in each district was divided by the population of the district and scaled by 100,000 to reveal the number of help requests per million people. The scaled numbers are shown in Figure 5 (b). The downtown area of Shanghai including Hongkou, Jingan, Huangpu Districts have the highest normalized indices which can be interpreted as the most affected Districts under the strict lockdown policy.

Temporal Analysis

In terms of the number of requests under each category, which can be represented by the magnitude of the peaks, conforms the patterns revealed by Figure 3. The numbers reach

their climax on April 14th, 18 days after the Shanghai lockdown. Then the number of requests quickly drops and remains at a low and stable level after April 20th.
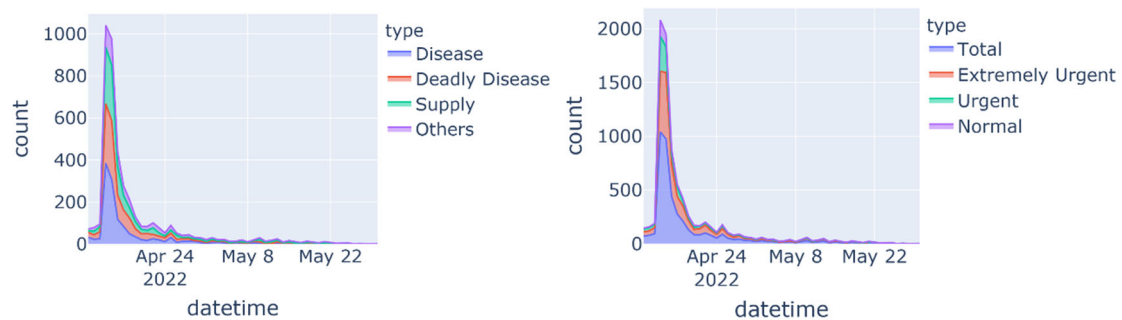

Figure 6: Temporal patterns of help request.

Dashboard

A dashboard was designed and implemented to better observe and locate the help requests sent by Shanghai residents. Figure 7 shows the individual-level user interface of the dashboard. It is composed of a map showing the geolocated help requests, a table showing some help request information in detail, and a temporal figure at the bottom of the page. On the top of the page, the total numbers of help requests, solved cases, following messages, and remaining requests are listed. Figure 8 displays the community-level user interface, which aggregates the number of help requests at the District level and presents the number of requests under each category in each District in a bar plot. This dashboard updates its content automatically after the backend application finishes scraping and pre-processing the data on a daily basis.
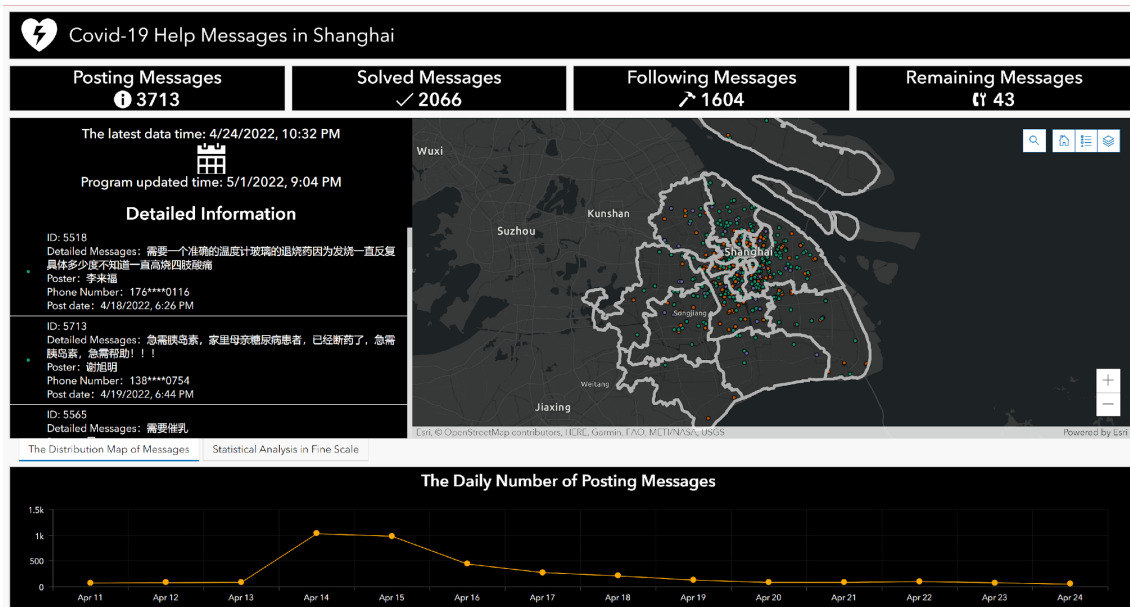

Figure 7: Individual-level user interface of the help request dashboard for Shanghai lockdown
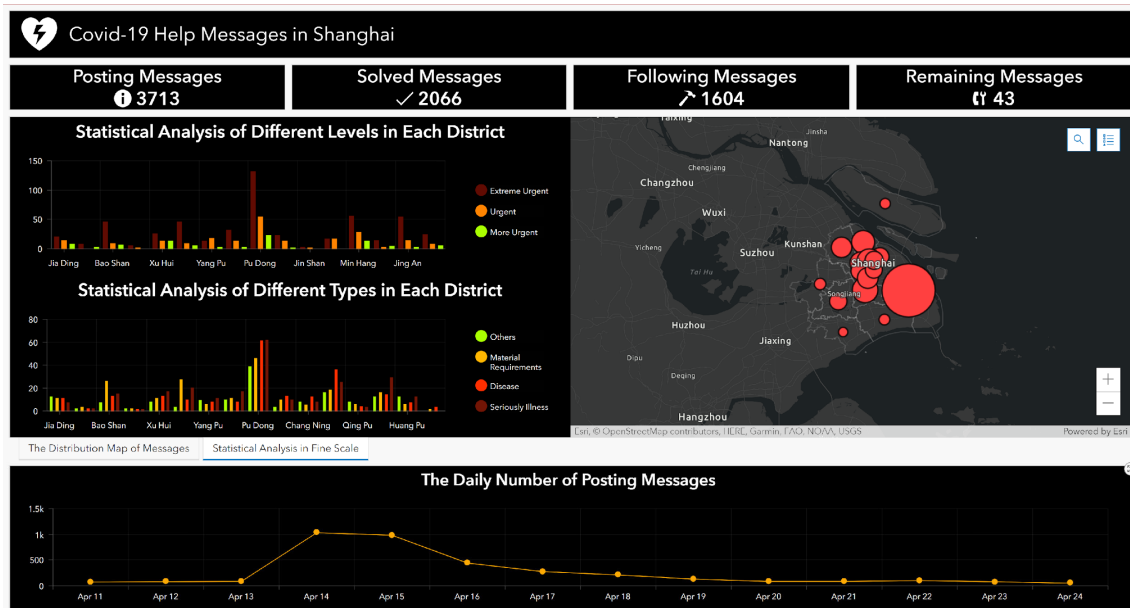
Figure 8: Community-level user interface of the help request dashboard for Shanghai lockdown

Discussion and Conclusion

This investigation harvests and visualizes help requests posted on a mutual-help platform during the Shanghai lockdown. Spatial and temporal analysis is conducted and indicates that Pudong, Minhang and Baoshan District have the highest number of help requests while the downtown area including Hongkou, Jingan and Huangpu District have the highest normalized index. The temporal patterns show an acute requirement for help on April 14th and the situation quickly alleviates in the following day. After April 20th, the request remains low and steady. An interactive and automatically updating dashboard is built to better monitor the urgent needs of the people in Shanghai.

Studies can continue in the following directions:

(1) The strictness of the lockdown policy, the number of confirmed cases, the human mobility datasets, and the number of help requests posted can be analysed simultaneously to reveal the correlation and causal relationship.

(2) The relationship between the help request and the number and location of the hospitals in each district and their availability during the lockdown phase can be probed.

(3) The detailed information of the help requests can be analysed with Natural Language Processing techniques to observe the topics discussed to reveal the fine-grained public concerns and needs during strict lockdown policies.

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