Evaluating Community Resilience through Social Media during the first infection wave peak after reopening in Beijing, China

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Introduction

Community Resilience is an increasingly salient construct in the domains of disaster preparedness, emergency response and crisis recovery. During the COVID-19 pandemic, crucial features of community resilience have included individual-level responses and preparedness.

- Social media is used for data sharing, fundraising and seeking/providing assistance during public health emergencies. In the COVID-19 context, posts relating to the demand in pandemic possess qualities of originality and authenticity.
- Weibo is the most popular Chinese public social media platform similar to Twitter.
- In the month that followed December 8th, 2022, China gradually lifted almost all of covid-19 pandemic restrictions. The number of infected individuals grew rapidly afterward, leading to a high demand for conventional medicines.

Objective

- This study aims to explore the community resilience outcomes of Beijing residents in the most popular Chinese social media platform Weibo.
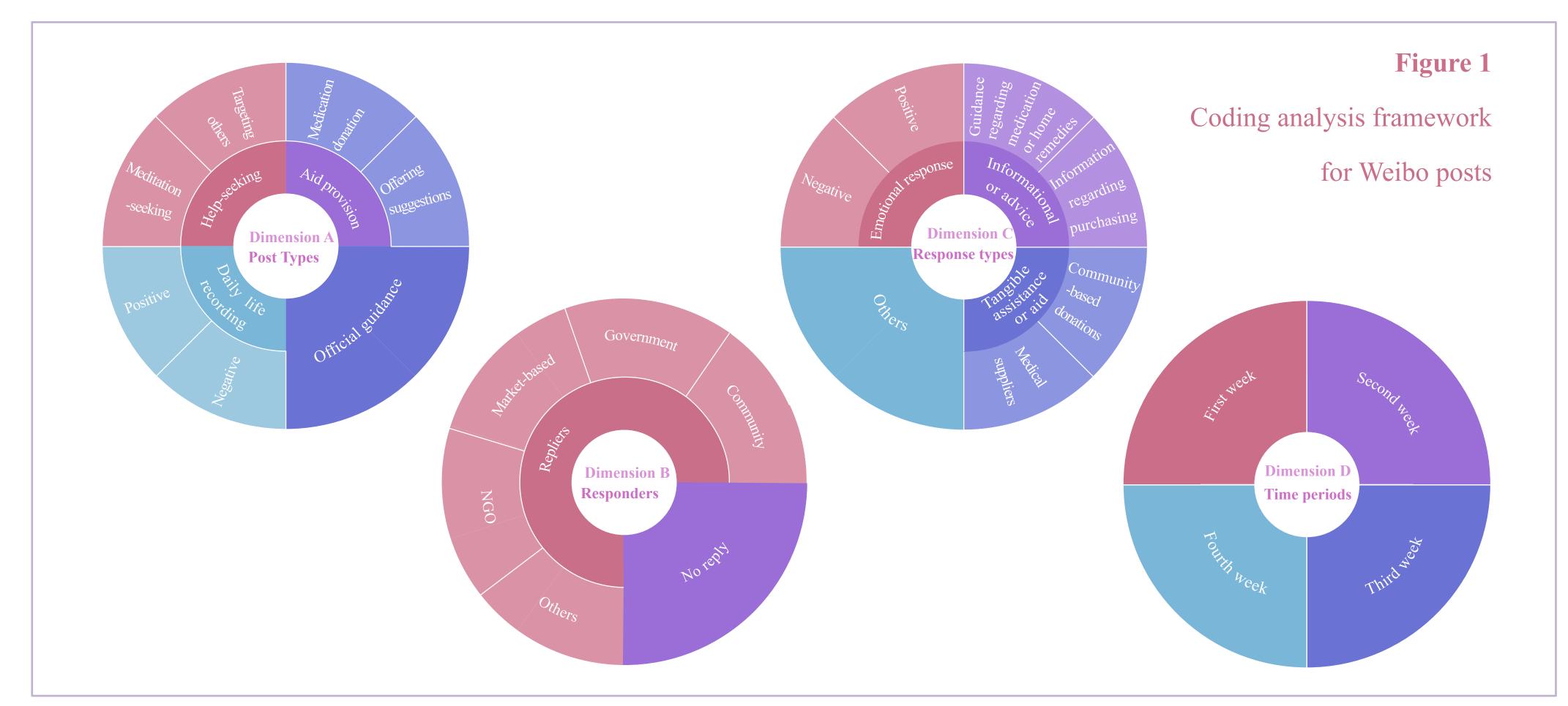
Methods

Data collection

- We chose Beijing, one of the first large Chinese cities to reopen, as our sample area.
- We collected all COVID-19-related continuous Weibo posts with geotagged between December 8th, 2022 and January 7th, 2023.
- Search terms used included posts seeking help and those concerned with specific conventional drugs used to combat COVID-19, all of which were already in short supply on the market.

Coding procedure

- A standardized data encoding format was established based on characteristics of help-seeking posts during the selected period.
- The encoded content was divided into four dimensions, represented by 24 items.
- Weibo posts corresponding to a certain item were marked with a "1" tag on the corresponding item; otherwise, these were marked "0".

Figure 1
Coding analysis framework for Weibo posts

Statistical analysis

- **Python crawling** – A crawler was used to capture data about user information, posts reposts, replies and likes relating to these posts.
- **Machine Learning** – The BERT-base-Chinese model was used for deep learning-based text classification for Weibo posts in the study.
- **Word clouds** – Python 3.8 was used to create word cloud diagrams to investigate the performance of keywords in posts published by users after the reopening of Beijing.
- **Pearson's chi-square test** – This was used to compare differences between discrete categories of posts in the study.

Results

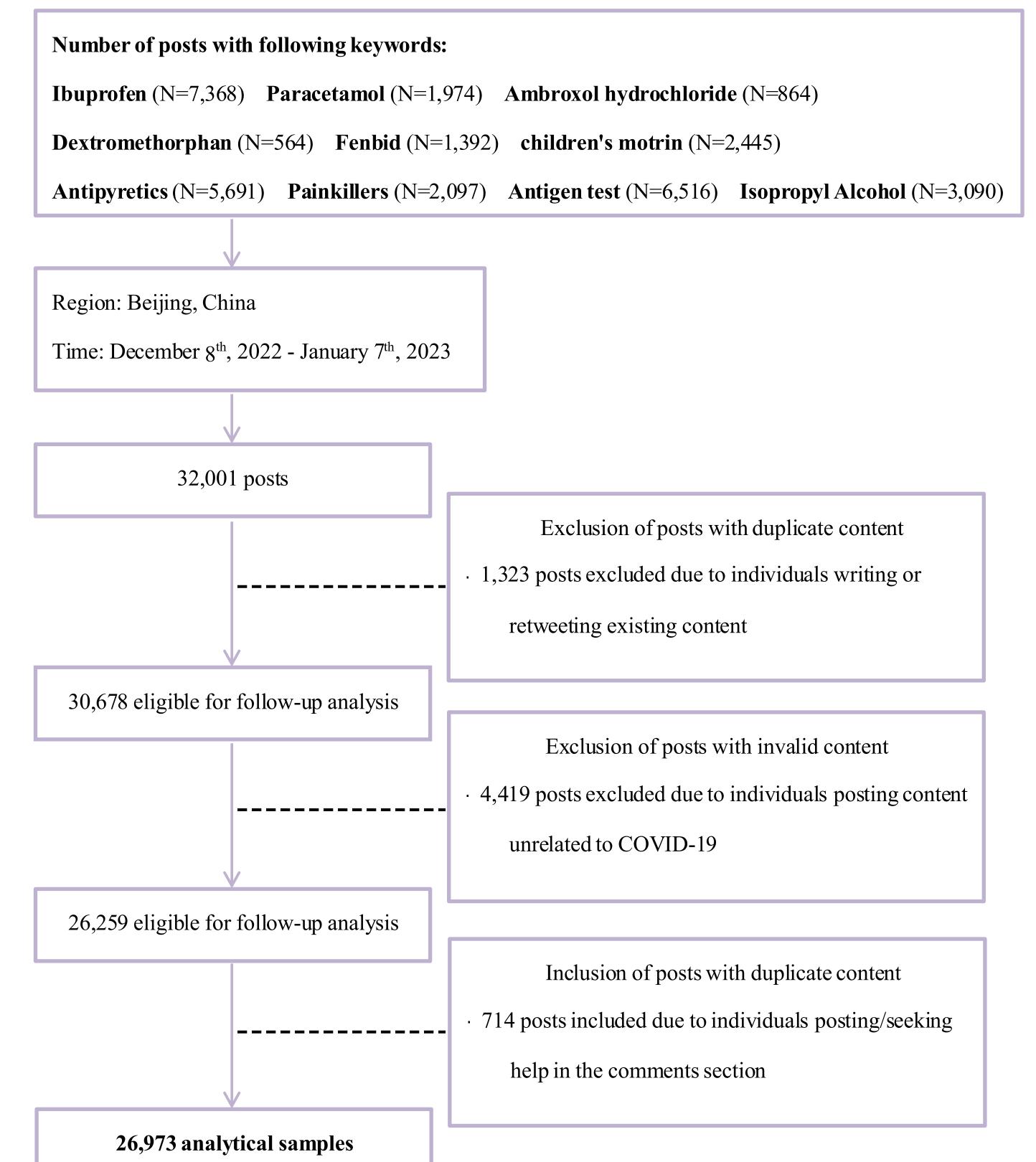### Figure 2 Flow diagram of inclusion and exclusion criteria of Weibo posts

Number of posts with following keywords:

Ibuprofen (N=7,368) **Paracetamol** (N=1,974) **Ambroxol hydrochloride** (N=864)
Dextromethorphan (N=564) **Fenbid** (N=1,392) **children's motrin** (N=2,445)
Antipyretics (N=5,691) **Painkillers** (N=2,097) **Antigen test** (N=6,516) **Isopropyl Alcohol** (N=3,090)

Region: Beijing, China
Time: December 8th, 2022 - January 7th, 2023

32,001 posts

Exclusion of posts with duplicate content
· 1,323 posts excluded due to individuals writing or retweeting existing content

30,678 eligible for follow-up analysis

Exclusion of posts with invalid content
· 4,419 posts excluded due to individuals posting content unrelated to COVID-19

26,259 eligible for follow-up analysis

Inclusion of posts with duplicate content
· 714 posts included due to individuals posting/seeking help in the comments section

26,973 analytical samples

Table 1 Sample characteristics (N=26,973)

		N	%
Dimension A			
Help-seeking	Medication-seeking	11235	41.65
	Targeting others	915	3.39
Aid provision	Medication donation	5244	19.44
	Offering suggestions	5019	18.61
Official guidance		4908	18.20
Daily life recording	Positive	9426	34.95
	Negative	3900	14.46
Dimension B			
Repliers	Community	17052	63.22
	Governmental	429	1.59
	Market-based	3099	11.49
	NGO	120	0.44
	Others	168	0.62
No reply		9327	34.58
Dimension C			
Emotional response	Positive	8226	30.50
	Negative	1785	6.62
Information or advice	Guidance regarding medication or home remedies	4761	17.65
	Information regarding purchasing	537	1.99
Tangible assistance or aid	Community-based donations	8928	33.10
	Medical suppliers	444	1.65
Others		11952	44.31
Dimension D			
First week		13968	51.79
Second week		8007	29.69
Third week		4365	16.18
Fourth week		1956	7.25

Table 2 General features of Weibo posts on four dimensions

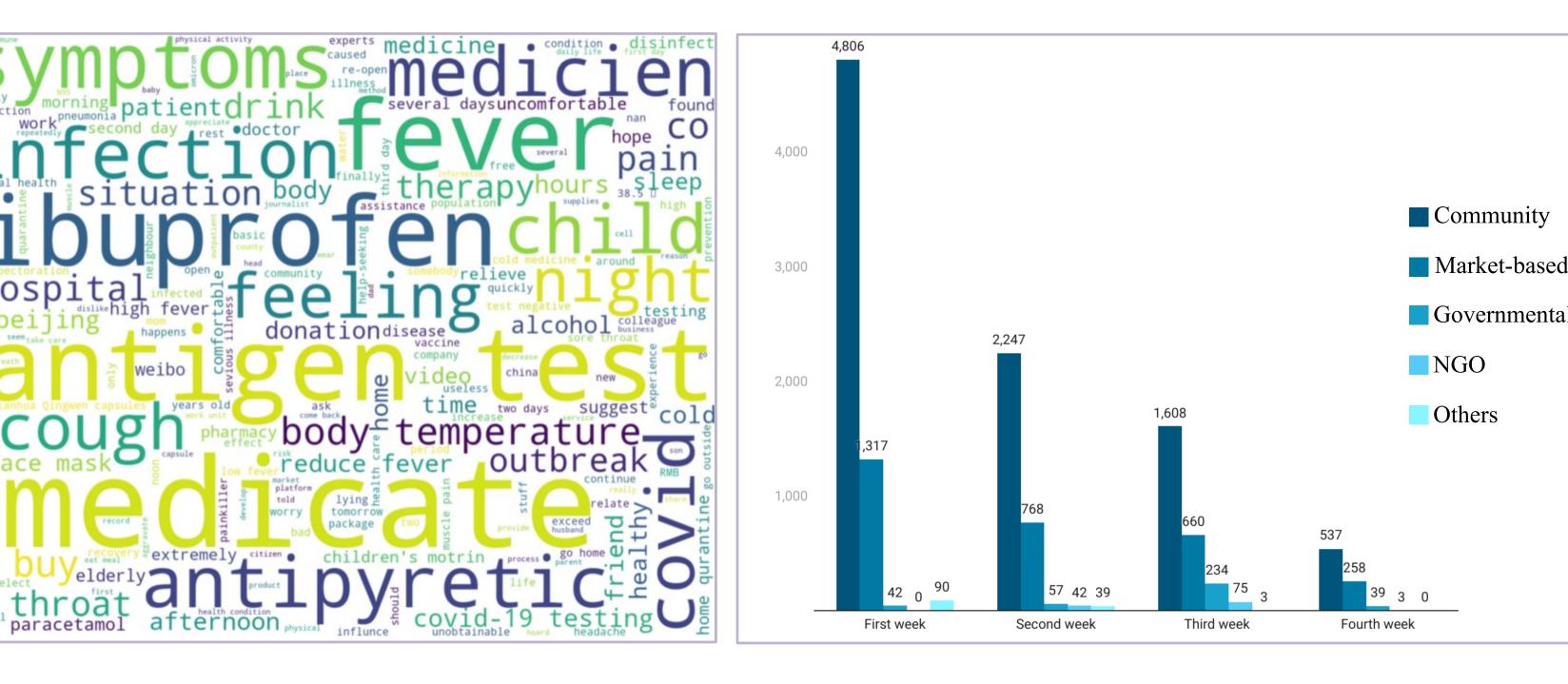| Dimension A	Help-seeking (N=12150)				Aid provision (N=10263)				Official guidance (N=4908)		Daily life recording (N=13326)				P-value
	Medication-seeking (N=11235)		Targeting others (N=915)		Medication donation (N=5244)		Offering suggestions (N=5019)		Reposting official guidance (N=4908)		Positive (N=9426)		Negative (N=3900)		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Dimension B															
Repliers — Community	8493	69.90	705	5.80	4296	41.86	2691	26.22	2202	44.87	5220	39.17	1971	14.79	
Governmental	360	2.96	12	0.10	333	3.24	126	1.23	150	3.06	27	0.20	24	0.18	
Market-based	2811	23.14	192	1.58	864	8.42	261	2.54	231	4.71	429	3.22	261	1.96	
NGO	99	0.81	21	0.17	117	1.14	3	0.03	81	1.65	9	0.07	0	0.00	
Others	132	1.09	0	0.00	21	0.20	9	0.09	9	0.18	69	0.52	45	0.34	
No reply	1170	9.63	114	0.94	429	4.18	2106	20.52	2490	50.73	3903	29.29	1713	12.85	P=0.001
Dimension C															
Emotional response — Positive	3477	28.62	234	1.93	1392	13.56	1641	15.99	1230	25.06	3912	29.36	1029	7.72	
Negative	684	5.63	234	1.20	246	2.89	324		468	3.51	780	5.85			P=0.001
Information or advice — Guidance regarding medication or home remedies	1740	14.32	360	2.96	666	6.49	1551	15.11	1104	22.49	1464	10.99	474	3.56	
Information regarding purchasing	342	2.81	24	0.20	189	1.84	147	1.43	60	1.22	51	0.38	36	0.27	P=0.001
Tangible assistance or aid — Community-based donations	7407	60.96	345	2.84	3879	37.80	363	3.54	429	8.74	1713	12.85	528	3.96	
Medical suppliers	405	3.33	72	0.59	33	0.32	63	0.61	30	0.61	66	0.50	36	0.27	P=0.001
Others	2349	19.33	162	1.33	795	7.75	2379	23.18	2781	56.66	5172	38.81	2235	16.77	P=0.001
Dimension D															
First week	5892	48.49	279	2.30	1584	15.43	2325	22.65	1980	40.34	5676	42.59	2523	18.93	P=0.001
Second week	2760	22.72	273	2.25	1761	17.16	1227	11.96	1560	31.78	2274	17.06	765	5.74	P=0.002
Third week	1944	16.00	282	2.32	1539	15.00	867	8.45	771	15.71	1041	7.81	399	2.99	P=0.001
Fourth week	639	5.26	81	0.67	360	3.51	600	5.85	597	12.16	435	3.26	213	1.60	P=0.001

Figure 3 Word cloud of most frequent words in Weibo posts

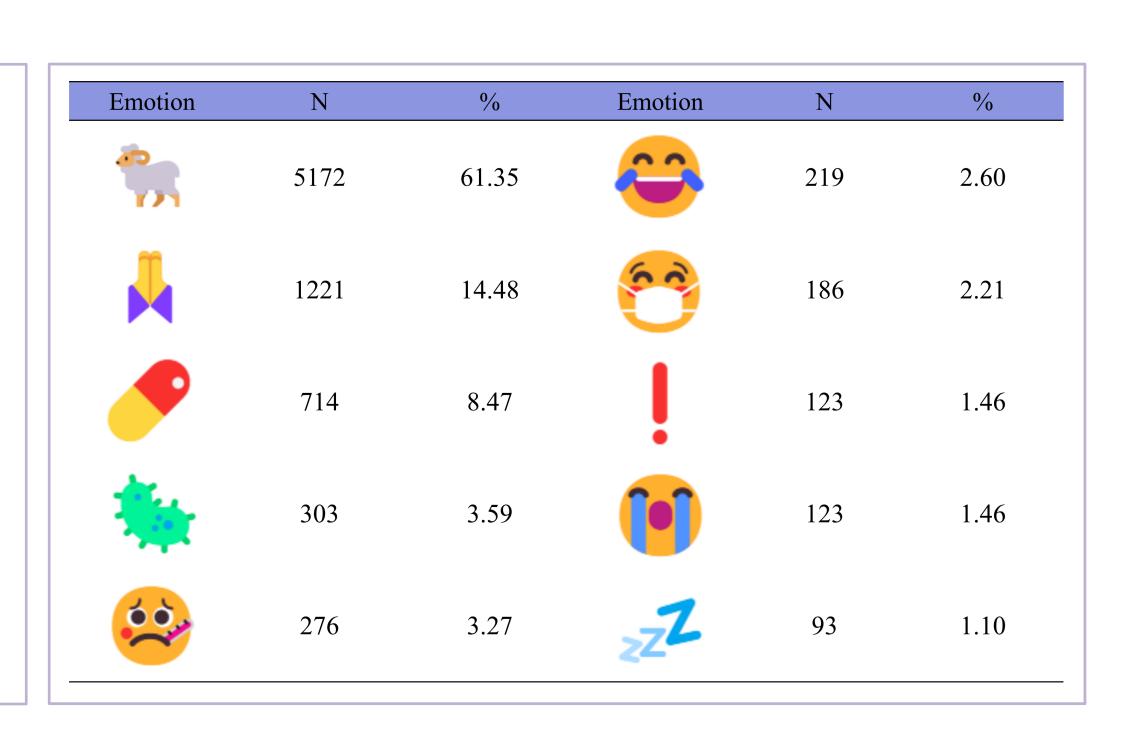**Figure 4** Numbers of responders to help-seeking posts across different time periods

Table 3 Top 10 emojis adopted in Weibo posts content between December 8th, 2022 and January 7th, 2023

Emotion	N	%	Emotion	N	%
🐑	5172	61.35	😂	219	2.60
	1221	14.48	😷	186	2.21
	714	8.47	❗	123	1.46
	303	3.59		123	1.46
🥴	276	3.27	💤	93	1.10

Discussion

- Difficult conditions may lead to communities being unable to receive external aid during the acute phase of a disaster. This highlights the need for communities to leverage existing resources.
- The government needs to conduct advance assessment of public health emergencies and to engage in medical resource storage and allocation ahead of time.
- The role of NGOs needs to be strengthened.

Limitations

- Not all online self-organized rescue activities are carried out through Weibo. In the case of those who received assistance without posting about this, there is no evidence of such activity in the dataset.
- We investigated only one information source related to community resilience in the context of a health crisis on Weibo. Other social media platforms should be investigated in future research.

Conclusion

- Our study demonstrates the remarkable degree to which community support in the given context has been timely as compared were governmental assistance. The data and analysis also demonstrate that enhancing community resilience is a critical aspect of responding to public health emergencies.