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WHEN PUBLIC HEALTH COMMUNICATION INTERTWINES WITH SOCIAL MEDIA LOGIC
A Focus on the Early Phase of COVID-19 Pandemic in Italy

Abstract
During recent years, public health organizations have faced the challenges of digitization, adopting new communication practices. The COVID-19 pandemic has impacted on this process, accelerating the digitization of healthcare communication. In this context, utilizing a theoretical framework that intertwines health communication and social media studies, this article investigates how local health authorities located in Lombardy (North of Italy) managed COVID-19 pandemic on their Facebook pages during the first phase of the emergency. The findings highlight the growing number of COVID-19 posts in the pages and a significant response from social media users in terms of interactions and engagement, reiterating the strategic role of these organizations in healthcare communication. Furthermore, they reveal a gradual adaptation of health communication to the dynamics of social media, especially in terms of popularity, programmability, and connectivity. The emergence of a platform-based approach to healthcare communication is also discussed.

Keywords
Social media; health communication; Facebook; COVID-19; digital methods; local health authorities; platform society.
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1. INTRODUCTION

During recent years, public health organizations have faced the challenges of digitization. The COVID-19 pandemic has affected these processes, enhancing the visibility and the strategic role of digital technologies for fostering telemedicine, but also for accelerating the digitization of healthcare communication. These processes have found fertile ground on social media, used by laypersons also to connect with public institutions to seek COVID-19 information, to search for trustful sources, help and assistance. Consequently, public health organizations have decided to open new social media channels

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and to reinforce the existing ones, in order to inform citizens and to fight fake news about the virus.

In this context, within a theoretical framework that hybridizes health communication and social media studies, this article investigates how public health organizations, in particular local health authorities located in Lombardy (North of Italy), addressed the COVID-19 crisis on their Facebook pages during the first phase of the emergency (January-March 2020).

2. Literature review

2.1. *When health communication meets digital platforms*

In the last twenty years, digital platforms have deeply modified and shaped communication practices and research trends in the field of healthcare and health communication[1]. In this context several scholars have started using the terms "Medicine 2.0"[2] and "Health 2.0"[3] to emphasise this profound shift for healthcare, including the communication aspects of these changes. These definitions highlight a new phase for health organizations, in which a relevant role is played by social media in transforming communication practices and reshaping relations with health professionals, patients, health organizations and providers[4]. Traditional health communication models have thus integrated participatory platforms to address contemporary communication ecologies where media consumptions' patterns differ significantly from the past. Social media, in this context, represent innovative communication environments and not merely additional channels to spread health-related information. This paradigm shift is evident from several perspectives[5]. First, social media can empower citizens by providing them with the ability to search for various health-related information sources, share comments and experiences online, find emotional support, or interact with health organizations. Second, social media serve as a strategic leverage for doctors, nurses, and medical staff to access studies about health issues, manage specific categories of patients, or maintain relationships with communities of practice. Third, from an organizational perspective, social media are used to enrich communication mixes, thereby increasing the visibility of health messages to different online publics, including mass media[6]. Additionally, these platforms are used to gather citizens' feedback, monitoring online conversations and possible criticalities and

[1] A. Sendra, S. Torkkola, E. Govender, "The Breakthrough of Digital Health: Communication as the Catalyst of the Transformation of Care", *Catalan Journal of Communication & Cultural Studies*, 13, 2 (2021): 169-178; A.F. Hannawa *et al.*, "Identifying the Field of Health Communication", *Journal of Health Communication*, 20, 5 (2015): 1-10, http://dx.doi.org/10.1080/10810730.2014.999891.

[2] G. Eysenbach, "Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness", *Journal of Medical Internet Research*, 10, 3 (2008): e22.

[3] T.H. Van De Belt *et al.*, "Definition of Health 2.0 and Medicine 2.0: A Systematic Review", *Journal of Medical Internet Research*, 12, 2 (2010): e18.

[4] D. Lupton, *The Quantified Self*, Malden, MA: Polity, 2016; S. Elhajjar, F. Ouaida, "Use of Social Media in Healthcare", *Health Marketing Quarterly*, 39, 2 (2022): 173-190, https://doi.org/10.1080/07359683.2021.2017389.

[5] A. Lovari, *Social media e comunicazione della salute*, Milano: Guerini Scientifica, 2017.

[6] J. Shi, T. Poorisat, C.T. Salmon, "The Use of Social Networking Sites (SNS) in Health Communication Campaigns: Review and Recommendations", *Health Communication*, 33, 1 (2016): 49-56; L. Fernández-Luque, T. Bau, "Health and Social Media: Perfect Storm of Information", *Healthcare Informatics Research*, 21, 2 (2015): 67-73, https://doi.org/http://dx.doi.org/10.4258/hir.2015.21.2.67.

disservices[7]. Scholars also started to explore the role of visuals (photos, infographics, animated GIFs, videos, etc.) in health communication, as means to make contents clearer for laypersons with low levels of health literacy, and to foster users' engagement on social media[8]. These studies highlighted the presence of several user-generated contents, contrasted with a lesser amount of institutional or professional content, with the risk of increasing the spread of misinformation or disinformation[9]. Besides, visual narratives like YouTube, TikTok or Instagram videos are also perfect outlets for narrating personal journeys of illness, diagnosis, and recovery, such as in cancer patients[10].

In this context, social media have gained a relevant role also for managing communication during emergencies[11]. Indeed, these platforms have become discursive arenas for the publics' fears and concerns about diseases, health emergencies and other health issues, often spreading *epidemics of fear*[12], panic and disinformation online[13]. For example, panic surrounding the 2009 H1N1 outbreak was influenced by digital conversations[14], tracing the emerging traits of a global and interconnected crisis that will become more evident with the SARS and Ebola epidemics. Sastry and Lovari[15] coined the term "epidemic 2.0" to designate challenges and possibilities brought by digital platforms to health communication as a discipline, and specifically to communication function about and during epidemics. Furthermore, various scholars have pointed out how public health organizations have been often unprepared or slow to face health emergencies on social media responding to citizens' needs and mass media attention[16]; only recently,

[7] S. Moorhead *et al.*, "A New Dimension of Health Care: Systematic Review of the Uses, Benefits, and Limitations of Social Media for Health Communication", *Journal of Medical Internet Research*, 15, 4 (2013): e85, https://doi.org/10.2196/jmir.1933; Fernández-Luque, Bau, "Health and Social Media: Perfect Storm of Information".

[8] J.P.D. Guidry *et al.*, "Tweeting about #diseases and #publichealth: Communicating Global Health Issues across Nations", *Health Communication*, 35, 9 (2020): 1137-1145, https://doi.org/10.1080/10410236.2019.1620089; D. Calvo, L. Cano-Orón, G. Llorca-Abad, "COVID-19 Vaccine Disinformation on YouTube: Analysis of a Viewing Network", *Communication and Society*, 35, 2 (2022): 223-238, https://doi.org/10.15581/003.35.2.223-238.

[9] K. Bora *et al.*, "Does Social Media Provide Adequate Health Education for Prevention of COVID-19? A Case Study of YouTube Videos on Social Distancing and Hand-Washing", *Health Education Research*, 36, 4 (2021): 398-411, https://doi.org/10.1093/her/cyab028; G. Ducci, A. Lovari, N. Righetti, "The Challenges in Communicating Public Health Data: An Analysis of Italian Regions' Social Media Use during the COVID-19 Pandemic on Facebook", *European Journal of Health Communication* (2024, in press).

[10] R.H. Hu *et al.*, "Quality and Accuracy of Gastric Cancer Related Videos in Social Media Videos Platforms", *BMC Public Health*, 22 (2022): 1-8, https://doi.org/10.1186/s12889-022-14417-w.

[11] A. Lovari, N. Righetti, "Pandemic Communication and Problematic Information", in *Palgrave Encyclopedia of the Health Humanities*, Palgrave Macmillan, 2023: 1-7; A. Lovari, N. Righetti, "La comunicazione pubblica della salute tra infodemia e fake news: il ruolo del Ministero della Salute nella sfida social al COVID-19", *Mediascapes Journal*, 15 (2020): 156-173.

[12] G. Eysenbach, "Credibility of Health Information and Digital Media: New Perspectives and Implications for Youth", in *Digital Media, Youth, and Credibility*, edited by M.J. Metzger and A.J. Flanagin, Cambridge, MA: The MIT Press, 2008: 123-154.

[13] P.M. Waszak, W. Kasprzycka-Waszak, A. Kubanek, "The Spread of Medical Fake News in Social Media: The Pilot Quantitative Study", *Health Policy and Technology*, 7, 2 (2018): 115-118, https://doi.org/10.1016/j.hlpt.2018.03.002; Y. Li *et al*., "Health Misinformation on Social Media: A Systematic Literature Review and Future Research Directions", *AIS Transactions on Human-Computer Interaction*, 14, 2 (2022): 116-149, https://doi.org/10.17705/1thci.00164.

[14] C. Chew, G. Eysenbach, "Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak", *PLoS ONE*, 5, 11 (2010): e14118, DOI: 10.1371/journal.pone.0014118; B.F. Liu, S.H. Kim, "How Organizations Framed the 2009 H1N1 Pandemic Via Social and Traditional Media: Implications for US Health Communicators", *Public Relations Review*, 37, 3 (2011): 233-244, DOI: 10.1016/j.pubrev.2011.03.005.

[15] S. Sastry, A. Lovari, "Communicating the Ontological Narrative of Ebola: An Emerging Disease in the Time of 'Epidemic 2.0'", *Health Communication*, 32, 3 (2017): 329-338.

[16] J.P.D. Guidry *et al.*, "Ebola on Instagram and Twitter: How Health Organizations Address the Health Crisis in Their Social Media Engagement", *Public Relations Review*, 4, 3 (2017): 477-486.

these organizations have started to strategically manage their digital presence to fight the spreading of disinformation on social media, also collaborating with other strategic partners[17].

2.2. *The challenge of digital platforms*

Social media, like any other media, have a precise structure and organization that impacts also on the activities that users can undertake within them. They are platforms, that is to say, online infrastructures driven by specific logics and mechanisms[18] that affect the economic, social, and cultural environment in which they operate. Scholars speak of *platformization*, namely the transformative power that social media and other corporations (like Amazon, Microsoft or Google) have into contemporary society about economic, governmental, and infrastructural processes[19].

According to Van Dijck and Poell[20], social media are driven by four logics: programmability, popularity, connectivity, and datafication. These logics inform users' activities, and users' actions can also influence platforms, in a process of mutual shaping. We believe that social media logics serve as a valuable theoretical tool for understanding the events that happened during the first 90 days of the COVID-19 pandemic at a meso-level. These logics bridge the micro-level of users' activities with the organizational level, as outlined in the theoretical framework.

Programmability is the capacity of social media to encourage content production by users while users may, in turn, influence the flow of communication with their agency. Popularity indicates the capacity of a content to be "likeable", including the logics of visibility and invisibility connected to the users' interactions with contents. Connectivity refers to the capacity of social media to make connections between citizens, brands, public institutions, and other stakeholders present on them. Datafication means that platforms can quantify and transform into data user's online behaviours through data mining and tracing.

The process of mutual shaping is two-folded. On the one side, users are pushed to follow social media logics to act within the platforms and to obtain visibility within them; on the other side users have the power to influence the circulation of contents and the evolution of platforms themselves. Companies, for example, have also found their way to keep up with platforms' logics, mainly applying social media marketing strategies to define and maintain their digital presence[21].

[17] K.H. Jacobsen, E.K. Vraga, "Improving Communication about COVID-19 and Other Emerging Infectious Diseases", *European Journal of Clinical Investigation*, 50, 5 (2020): e13225m, https://doi.org/10.1111/eci.13225; A. Lovari, "Spreading (Dis)Trust. COVID-19 Misinformation and Government Intervention in Italy", *Media and Communication*, 8, 2 (2020): 458-546, DOI: 10.17645/mac.v8i2.3219; I. Tahamtan *et al*., "The Mutual Influence of the World Health Organization (WHO) and Twitter Users during COVID-19: Network Agenda-Setting Analysis", *Journal of Medical Internet Research*, 24, 4 (2022): e34321, https://doi.org/10.2196/34321.

[18] T. Gillespie, "The Politics of 'Platforms'", *New Media and Society*, 12, 3 (2010): 347-364. https://doi.org/10.1177/1461444809342738; J. Van Dijck, T. Poell, "Understanding Social Media Logic", *Media and Communication*, 1, 1 (2013): 2-14, https://doi.org/10.12924/mac2013.01010002.

[19] J. Van Dijck, T. Poell, M. De Waal, *The Platform Society: Public Values in a Connective World*, New York: Oxford University Press, 2018; A. Helmond, "The Platformization of the Web: Making Web Data Platform Ready", *Social Media and Society*, 1, 2 (2015): 1-11, https://doi.org/10.1177/2056305115603080.

[20] Van Dijck, Poell, "Understanding Social Media Logic".

[21] K.J. Freberg, *Social Media for Strategic Communication: Creative Strategies and Research-Based Applications*, Los Angeles: Sage, 2019.

Before the COVID-19 pandemic, theoretical reflections on the interplay between platforms and health primarily focused on the effects on human bodies and the exploitation of personal data[22]. There was comparatively less attention devoted to the broad spectrum of effects that social media have brought to public health communication practices. These areas of investigations were hugely explored during the COVID-19 pandemic with the aim to comprehend how public health institutions managed their communication, also considering the local cultural contexts[23]. By investigating the relationship between public health communication and platforms from the perspective of social media logics, this contribution adds to this body of research.

2.3. *Health communication and COVID-19 in Italy: a focus on the Lombardy region*

The diffusion of the SARS-CoV-2 virus has strongly impacted on healthcare treatments and services, as well as health communication activities implemented to face the emergency and the related crisis[24].

In Italy the health system is public, decentralized and characterized by a strong regionalization. The management of health communication is conducted at different levels: Ministry of Health, Region, local health authorities (LHAs), university hospitals and research institutes. The use of social media for public health communication has involved all these levels, with a growing process of institutionalization of these platforms for healthcare[25]. This growth was also influenced by organizational constraints, and a lack of coordination at central and regional level[26]. Italy was the first Western country to be affected by COVID-19 at the end of February 2020. The country immediately entered an emergency status from a health but also communication point of view, with the spreading of infodemic and disinformation about the virus leading to uncertainty and fears among the population[27].

Lombardy was the Italian epicentre of the first wave of the COVID-19 epidemic from many perspectives: a) after the identification of the "patient zero" in Codogno (20 February 2020), ten municipalities (23 February 2020) and then the entire regional territory (7 March 2020) were the first areas in which lockdowns were applied to stop the

[22] Lupton, *The Quantified Self*.

[23] M. Gupta *et al.*, "Media Coverage of COVID-19 Health Information in India: A Content Analysis", *Health Promotion International*, 37, 2 (2022), https://doi.org/10.1093/heapro/daab116; C. Hanson *et al.*, "National Health Governance, Science and the Media: Drivers of COVID-19 Responses in Germany, Sweden and the UK in 2020", *BMJ Global Health*, 6, 12 (2021): e006691, https://doi.org/10.1136/bmjgh-2021-006691; U. Kollamparambil, A. Oyenubi, C. Nwosu, "COVID-19 Vaccine Intentions in South Africa: Health Communication Strategy to Address Vaccine Hesitancy", *BMC Public Health*, 21, 2113 (2021): 1-12, https://doi.org/10.1186/s12889-021-12196-4; L. Aristei *et al.*, "Public Health Regulations and Policies Dealing with Preparedness and Emergency Management: The Experience of the COVID-19 Pandemic in Italy", *International Journal of Environmental Research and Public Health*, 19, 3 (2022): 1091, https://doi.org/10.3390/ijerph19031091; Y. Wu, F. Shen, "Exploring the Impacts of Media Use and Media Trust on Health Behaviors during the COVID-19 Pandemic in China", *Journal of Health Psychology*, 27, 6 (2022): 1445-1461, https://doi.org/10.1177/1359105321995964.

[24] W.T. Coombs, "Public Sector Crises: Realizations from COVID-19 for Crisis Communication", *Partecipazione e Conflitto*, 13, 2 (2020): 990-1001.

[25] R. Vaagan *et. al.*, "A Critical Analysis of the Digitization of Healthcare Communication in the EU: A Comparison of Italy, Finland, Norway, and Spain", *International Journal of Communication*, 15 (2021): 1718-1740.

[26] Sendra, Torkkola, Govender, "The Breakthrough of Digital Health: Communication as the Catalyst of the Transformation of Care".

[27] Lovari, "Spreading (Dis)Trust. COVID-19 Misinformation and Government Intervention in Italy".

outbreaks; b) the virus strongly impacted on its healthcare structures, especially in Bergamo, changing the access to medical services. All these factors had effects on public health communication at regional and local level. LHAs were the first institutions to face this situation, and they had to modify their communication strategies, especially on their digital channels. There was the urgent need to inform citizens about correct behaviours and preventive measures to avoid the contagion, but also to fight disinformation spread especially on social media. Indeed, these platforms have represented, together with television, the main channel to reach citizens during the outbreak[28].

Focusing on the unfolding of the social media logics during the first 90 days of the COVID-19 pandemic, and deepening the investigations conducted in a previous study at a macro-level[29], we investigate at a meso-level the outcomes of the intertwining of the platforms' logics and the LHAs social media communication by analysing the social media logics in action. Three research questions guided this study.

RQ1) Programmability. Did the COVID-19 pandemic affect the content of LHAs' social media communication? (i.e., the quantity of posting during the time frame considered, topics of the posts, sharing of posts from other institutions, use of hashtags).

RQ2) Popularity. Did the COVID-19 pandemic influence citizens' reception and thus engagement with the posts? (i.e., LHA's average engagement rate, engagement of COVID-19 and non COVID-19 posts, engagement of the different topics).

RQ3) Connectivity. Did the COVID-19 pandemic affect the kind of connection between the LHAs and online users? (i.e., sharing of posts, use of shared hashtags).

3. METHODS

We identified Local Health Authorities (LHAs) in Lombardy using the lists available on the official website of Regione Lombardia (Lombardy). Our focus was on two distinct types of LHAs: ATS, responsible for administrative-level territorial health management; ASST, authorities that aggregate hospitals and healthcare structures located in the areas where COVID-19 initially spread (Bergamo, Piacenza, Lodi, Milan). We identified official active social media pages for each LHAs, as well as that of Regione Lombardia. Our attention was directed toward the Facebook pages of the organizations, given that Facebook was the predominant platform used by LHA in Italy during the pandemic. The final sample comprised 14 Facebook pages, including those of 13 Local Health Authorities (LHAs) and Regione Lombardia.

Table 1 presents the list of the investigated authorities, the number of their page followers, and the number of posts published during the analysis period.

[28] M. Bucchi, B. Saracino, "Italian Citizens and COVID-19", *Public Understanding of Science Blog*, April 19, 2020, https://sagepus.blogspot.com/2020/04/italian-citizens-and-COVID-19-one-month.html. Accessed January 4, 2024.

[29] Locatelli, Lovari, "Platformization of Healthcare Communication: Insights from the Early Stage of the COVID-19 Pandemic in Italy".

Table 1 - *Map of the official social media profiles investigated*

Local Health Authorities	Facebook page followers	Number of posts
Regione Lombardia	209,422	348
ASST Papa Giovanni XXIII	21,936	126
ASST Grande Ospedale Metropolitano Niguarda	8,550	147
ASST di Cremona - Azienda Socio - Sanitaria Territoriale	11,471	118
ASST Santi Paolo e Carlo	5,296	128
ATS Bergamo	11,655	256
ASST Melegnano e della Martesana	2,175	85
ATS Brianza	7,453	161
ASST-Rhodense	2,822	190
ATS della Val Padana	5,577	200
ATS Città Metropolitana di Milano	3,244	92
ASST Centro Specialistico Ortopedico Gaetano Pini - CTO	3,508	69
ATS Insubria	3,646	52
ATS di Pavia	874	27
Total	297,629	1,999

Then collected the messages posted by the LHAs between January 1st and March 31, 2020. The posts (N=1,999) were retrieved with CrowdTangle[30] and analyzed using R. The dataset includes post messages and several other information like the posting date, interactions, and was used to answer RQ2. The engagement rates[31] of the posts were calculated and analyzed to assess the ability of the Facebook pages to engage their fan base.

To address RQ1 and RQ3, the content of the posts was evaluated using a coding scheme based on two dimensions: post topic and the role of visual communication. Specifically:

a) Posts were initially categorized as related or not to COVID-19, and then according to a categorization of social media health communication[32], which was adapted for

[30] CrowdTangle (CrowdTangle Team, 2021) is a Facebook-owned tool that tracks interactions on public content from Facebook pages and groups, verified profiles, Instagram accounts, and subreddits. It does not include paid ads unless those ads began as organic, non-paid posts that were subsequently "boosted" using Facebook's advertising tools. It also does not include activity on private accounts, or posts made visible only to specific groups of followers.

[31] Engagement rate is calculated as interactions divided by page followers, multiplied by 100.

[32] E. Cioni, A. Lovari, "Social Media for Health Communication: Implementation Issues and Challenges for Italian Public Health Authorities", in *Social Media and Mobile Technologies for Healthcare*, edited by M. Househ, E. Borycky, A. Kushniruk, Hershey: IGI Global (US), 2014: 237-263.

the pandemic context. The categorization includes: information on healthcare services; online events; health communication campaigns; LHAs storytelling (daily efforts against the pandemic, acquisition of new medical instruments); citizens' empowerment (information aiding citizens in avoiding contagion or managing lockdown stress); LHAs press/media coverage; staff recruitment for emergency response; fundraising activities; combating fake news; updates on COVID-19 epidemiological data; and sharing (posts that merely shared messages posted by others without adding text).

b) Concerning the role of visual elements in social media messages about health in both ordinary and crisis situations[33], the analysis distinguished between posts containing images (photos, infographics, digital posters, animated GIFs, and other types of images) and videos.

c) In the final phase, considering the logic of connectivity, the coders examined the presence of contents shared from other institutions, as well as the use of tags and hashtags in the texts of the posts. The coding process was conducted by two independent coders who were thoroughly trained by the authors. This process entailed an initial coding round on a sample dataset of 30 posts, followed by the discussion of coding decisions and disagreement with the authors. Subsequently, intercoder reliability was assessed on a random sample of 100 posts from the research dataset using Krippendorff's Alpha. The agreement level for all categories met or exceeded the recommended threshold of 0.80[34], allowing the coders to independently categorize the remainder of the dataset.

4. ANALYSIS

4.1. *Programmability and posts contents*

Regarding RQ1, the results indicate that the COVID-19 pandemic significantly influenced the volume of messages. The number of posts escalated from 388 in January to 591 in February, and further to 1,020 in March. The time series analysis (Fig. 1) highlights certain peaks in messaging, which are marked with dotted lines on the chart. These peaks correspond to major events: the discovery of "patient one" in Codogno on February 22 and the start of the national lockdown on March 10 and 11.

The analysis highlighted that 61.7% of the messages (1,232 out of 1,999 posts) were related to COVID-19 (RQ1). Regarding their content, almost the totality of messages (91.3%, 1,824) included a visual element, such as a picture (74.6%, 1,490) or a video (16.7%, 334). Posts on COVID-19 contain, in proportion, fewer pictures (69.2%) than those on other topics (83.2%), but they more often contain infographics (49.2% vs. 37.9%), and videos (22.3% vs. 7.7%). Figure 1 shows the distribution of posts over the three months by public health authority, divided into COVID-19 and non COVID-19 posts.

[33] Guidry *et al.*, "Tweeting about #diseases and #publichealth: Communicating Global Health Issues across Nations".

[34] K. Krippendorff, *Content Analysis: An Introduction to Its Methodology*, Thousand Oaks, California: Sage, 2004, 241.

Figure 1 - *Distribution of LHAs posts during time*

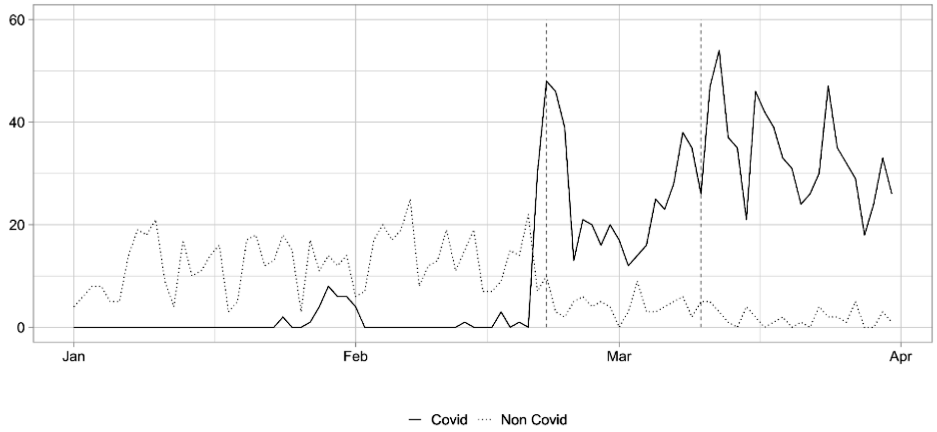
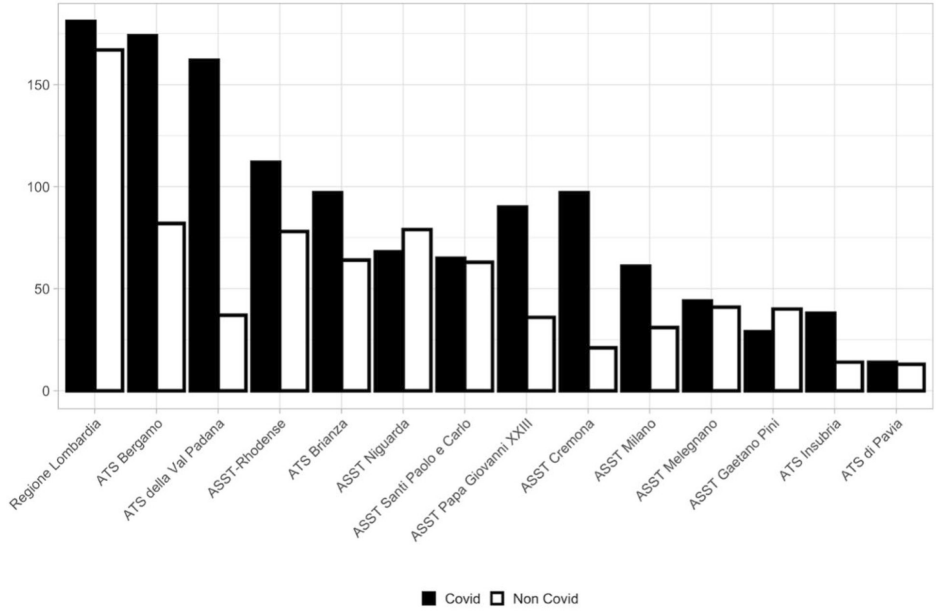


Figure 2 - *COVID-19 and non COVID-19 posts for LHAs*



Almost all the LHAs investigated (12 out of 14) have published more posts on COVID-19 than on all other topics, with more noticeable differences for ASST Cremona (82.2%, 97), ATS Val Padana (81.4%, 162), ATS Insubria (73.1%, 38), ASST Papa Giovanni XXIII (71.4%, 90), and ATS Bergamo (68%, 174), which are located in two of the regional areas (Bergamo and Cremona) most strongly impacted by the virus. As shown in Table 2, the content of these posts was mainly related to communication campaigns (i.e., #iorestoacasa - #Istayathome, #fermiamoloinsieme - #stopittogether), which oc-

cupied 18.5% of the LHAs Facebook timelines, citizens' empowerment (16.3%), LHA storytelling (12.2%) and information about healthcare services (11.2%). It is noteworthy that the storytelling of LHAs' activities reached approximately the same quantity of posts as more pragmatic information on healthcare services: these messages describe the relentless work of medical staffs when hospitals were overwhelmed by COVID-19 patients, publicly thank the community for gifts (like food for the medical staff), or donations of money or medical equipment like respirators or face masks, and report other forms of symbolic support such as drawings by children or artworks by local painters. Fewer posts deal with press/media reviews, fundraising activities, national or regional epidemiological data updates, staff recruiting, and online events. Messages to counteract fake news were the content least present on LHAs timelines (1.5%) after posts on online events (0.5%).

Table 2 - *Frequency of posts on COVID-19 by category*

Content of the Covid-19 posts	Number of posts	Percentage
Healthcare communication campaigns	229	18.5
Citizens' empowerment	202	16.3
Sharing	183	14.8
LHA storytelling	151	12.2
Information about health care services	139	11.2
Updates on Covid-19 epidemiological data	101	8.2
Media coverage	74	6
Fundraising activities	66	5.3
Staff recruiting	39	3.2
Other	29	2.3
Fight against fake news	18	1.5
Online events	6	0.5

4.2. *Popularity and users' engagement*

Addressing the second research question (RQ2), we observe the engagement growth over the three months (illustrated in Figure 3). There is a gradual increase in interactions with LHA posts during February, followed by a substantial rise in March, coinciding with the first national lockdown. Particularly high numbers of shares are noted during the latter half of February and the initial weeks of March. The posts that garnered the highest numbers of shares in this period predominantly concern recruiting new hospital staff to address the shortage of doctors and nurses, communications about donations to support families, the national lockdown, and storytelling about the impact of the virus on healthcare structures and services.

Figure 3 - *Time distribution of total interactions (7-day moving average)*

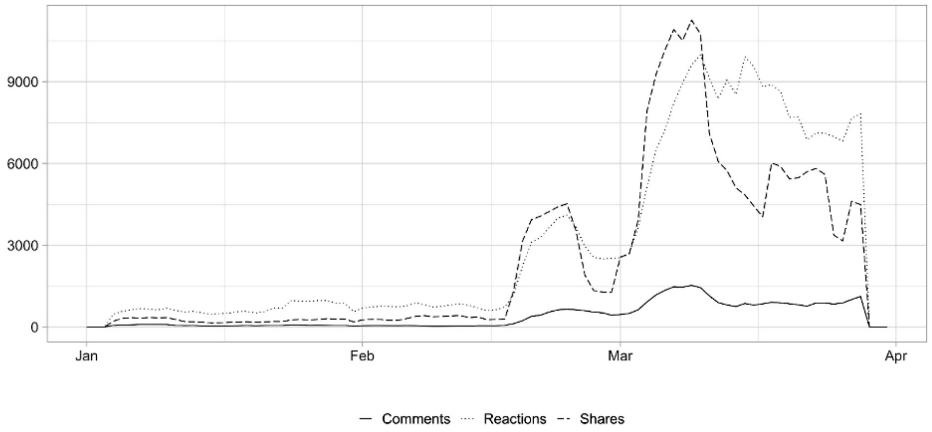


Table 3 presents the total interactions and average engagement rate for each of the LHAs investigated, detailing the metrics for posts on COVID-19 as well as for those on other topics.

Table 3 - *Total interactions and average engagement rate*

Local Health Authorities	Total interactions	Average engagement rate	Average engagement rate non-Covid posts	Average engagement rate Covid posts
ASST Centro Specialistico Ortopedico Gaetano Pini - CTO	3,194	1.3	1.1	1.6
ASST di Cremona - Azienda Socio - Sanitaria Territoriale	55,332	4.1	0.8	4.8
ASST Grande Ospedale Metropolitano Niguarda	58,048	4.6	2.1	7.6
ASST Melegnano e della Martesana	14,155	7.7	1.3	13.6
ASST Papa Giovanni XXIII	91,532	3.3	1.7	3.9
ASST Santi Paolo e Carlo	27,848	4.1	2.1	6.1
ASST-Rhodense	12,749	2.4	2	2.6
ATS Bergamo	26,744	0.9	0.4	1.1
ATS Brianza	13,199	1.1	0.3	1.6
ATS Città Metropolitana di Milano	4,223	1.4	0.9	1.7
ATS della Val Padana	7,354	0.7	0.2	0.8
ATS di Pavia	1,676	7.1	2.7	11.2
ATS Insubria	2,448	1.3	1	1.4
Regione Lombardia	255,313	0.4	0.2	0.5

The analysis of the engagement rate showed that, in general, the LHA posts containing images and videos have an average engagement rate of 2.2% and 2.1%, respectively, which is in line with the average engagement rate of all the posts (2.2%). However, the engagement increases for photos (3.0%), while it is lower for infographics and other types of images (1.7%). Also, the engagement rate is much higher for posts on COVID-19 (2.9%) than on other topics (1.0%). The maximum difference between the engagement rate of these categories is observed with ASST Melegnano (+946%) and ATS Cremona (+500%), while the lowest is seen in ASST Rhodense (+30%). Posts on COVID-19, categorized according to different aspects and their respective engagement rates, are reported in Table 4. Messages that received higher engagement rates, thus showing a relevant interest from LHAs Facebook fanbases, do not belong to the categories with the highest numbers of posts published on the pages. Messages against fake news are the penultimate category by post number but they reach the highest engagement rates (7.7%) along with posts on LHA storytelling. Posts on fundraising activities come third (4.5%), while online events (0.6%) and updates about epidemiological data (0.3%) were the categories with the lowest engagement rate.

Table 4 - *Categories of COVID-19 posts and average engagement rate*

Content of the Covid-19 posts	Average engagement rate
LHA storytelling	7.7
Fight against fake news	7.7
Fundraising activities	4.5
Citizens' empowerment	3.8
Media coverage	3.6
Staff recruiting	2.7
Information about health care services	2.1
Other	1.7
Healthcare communication campaigns	1.6
Online events	0.6
Sharing	0.5
Updates on Covid-19 epidemiological data	0.3

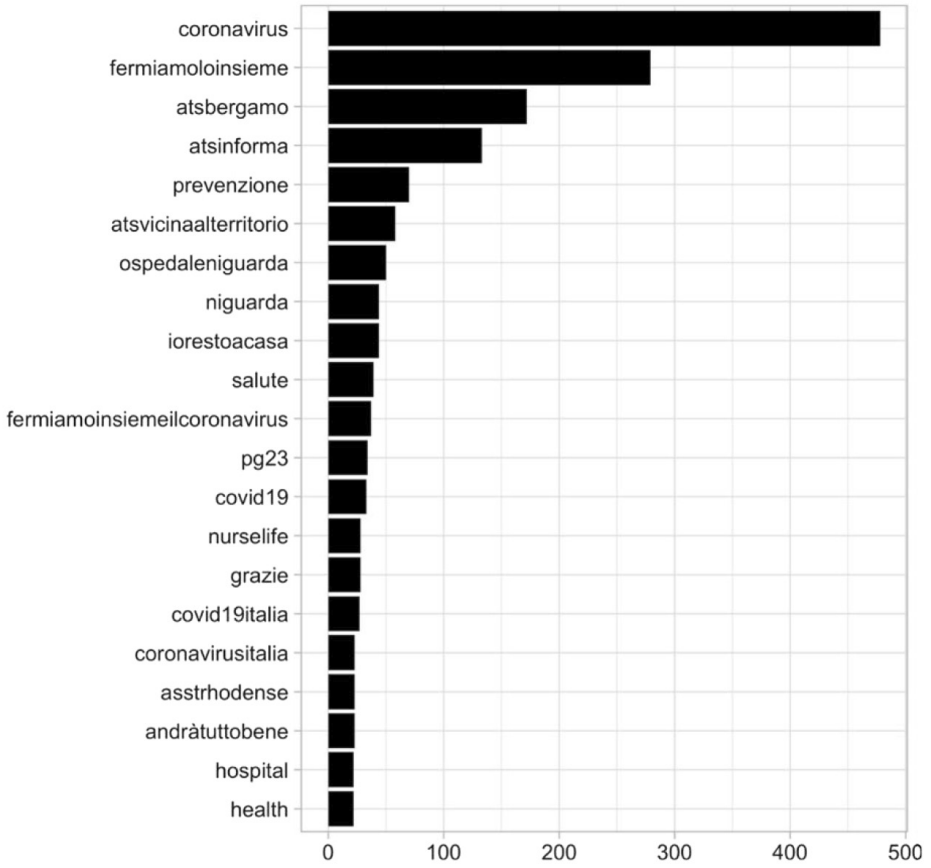
4.3. *Connectivity*

About RQ3, 1,412 of the overall 1,999 posts are original content published by local health authorities in their Facebook pages (70.7%), while 586 (29.3%) are messages shared from public sector organizations (such as Regione Lombardia, local municipalities) and public health institutions like the Italian Ministry of Health, other ATS and ASST.

Interestingly, it can be observed that among the 1,232 posts on COVID-19, LHAs original messages (59%, 727) reached a higher engagement rate (4.2%) than content shared from other Facebook pages (Ministry of Health, Regione Lombardia), which reached an engagement rate of only 1%, showing a higher attention and interactivity on original content. LHAs messages show a more diffuse use of hashtags (53.2%, 1,063).

The number of hashtags varies between 1 and 30, with an average of about 3 hashtags per post. The most popular hashtags are #coronavirus, followed by #fermiamoloinsieme ("let's stop it together"), and two hashtags almost exclusively used by ATS Bergamo: #atsbergamo, and #atsinforma.

Figure 4 - *The 20 most frequently used hashtags by the LHAs during the period under consideration*



5. DISCUSSION

The empirical analysis showed several points of interest for better understanding LHAs' social media use during the COVID-19 crisis in Lombardy. It also provided insights to expand the discussion, focusing on the intertwine between health communication, platform studies and social media logics.

The study highlights how the number of posts and interactions increased during the three months, mirroring the spread of the virus in the regional territory (RQ1). Peaks in the number of COVID-19 posts align with two pivotal moments of the pandemic first

phase in Italy (the identification of patient one, and the national lockdown). These peaks predominantly featured on the Facebook timelines of LHAs in the territories of the initial outbreaks, demonstrating their communication resilience.

This increasing content production can be contextualized within the logic of programmability[35] and interpreted as an organizational strategy to respond to the information demands of citizens and the media. This strategy involved increasing the publications of posts and sharing messages from other public institutions, thereby reaffirming their role as a public health service[36]. As highlighted in other COVID-19 studies in Italy, institutional social media channels have become mainstream mediums for public health communication[37], a finding echoed in research from other countries[38]. However, the growing communication flow can also be seen as a strategy to integrate and adapt LHAs' communication to the logics of other platforms, in a real-time and flexible manner, redefining content in response to the emergency's evaluation and providing continuous information support. In our research we did not analyze who was in charge of managing the Facebook pages (internal social media manager, freelancer, agency, etc.). Knowing the structure of public administration in Italy, we can argue that they likely were internal people. It would certainly be worth of further research to delve into the LHAs' managerial communication strategies and content production.

The analysis also indicated a dominance of the visual dimension within the posts: 91.57% of the messages contained images, social cards, or videos. This confirms trends identified in other COVID-19 communication studies in Italy[39]. This approach could be seen as a practice to normalize the multifaceted language of social media platforms and as a means to reach laypersons with lower health literacy levels, making content more accessible and noticeable amidst the myriad voices characterizing the pandemic's first phase[40]. This adaptation contrasts with previous findings showing a slow social media response by public health organizations[41], suggesting a progressive normalization of social media logics by LHAs accelerated by the pandemic.

[35] Van Dijck, Poell, "Understanding Social Media Logic".

[36] Lovari, *Social media e comunicazione della salute*.

[37] Bucchi, Saracino, "Italian Citizens and COVID-19"; Lovari, Righetti, "La comunicazione pubblica della salute tra infodemia e fake news: il ruolo della pagina Facebook del Ministero della Salute nella sfida social al COVID-19"; G. Ducci, "Alcuni nodi della comunicazione pubblica digitale di fronte alla pandemia: le regioni italiane su Facebook durante il lockdown", *Mediascapes Journal*, 18 (2022): 141-160.

[38] A.S. Raamkumar, S.G. Tan, H.L. Wee, "Measuring the Outreach Efforts of Public Health Authorities and the Public Response on Facebook during the COVID-19 Pandemic in Early 2020: Cross-Country Comparison", *Journal of Medical Internet Research*, 22, 5 (2020), https://doi.org/10.2196/19334; V.A.C. Ligo, C.M. Chang, H. Yi, "Contested Solidarity and Vulnerability in Social Media-Based Public Responses to COVID-19 Policies of Mobility Restrictions in Singapore: A Qualitative Analysis of Temporal Evolution", *BMC Public Health*, 21 (2021): 2232, https://doi.org/10.1186/s12889-021-12316-0; D. Azevedo *et al.*, "How Portuguese Health Entities Used Social Media to Face the Public Health Emergency during COVID-19 Disease", *International Journal of Environmental Research and Public Health*, 19, 19 (2022): 11942, https://doi.org/10.3390/ijerph191911942.

[39] Lovari, Righetti, "La comunicazione pubblica della salute tra infodemia e fake news: il ruolo della pagina Facebook del Ministero della Salute nella sfida social al COVID-19"; A. Lovari, G. Ducci, N. Righetti, "Responding to Fake News: The Use of Facebook for Public Health Communication during the COVID-19 Pandemic in Italy", in *Communicating COVID-19*, edited by M. Lewis, E. Govender, K. Holland, Cham: Palgrave Macmillan, 2021: 251-275.

[40] A. Sendra *et al.*, "Post-Pandemic Routes in the Context of Latin Countries: The Impact of COVID-19 in Italy and Spain", in *The COVID-19 Crisis: Social Perspectives*, edited by D. Lupton and K. Willis, New York: Routledge, 2021: 156-167; J. Steinke *et al.*, "'Cover Your Mouth and Nose': Communication about Health Protection Behaviors by Role Models in YouTube COVID-19 Videos for Children", *Journal of Science Communication*, 21, 3 (2022): 9-25.

[41] P. Tirkkonen, V. Luoma-aho, "Online Authority Communication during an Epidemic: A Finnish Example", *Public Relations Review*, 37, 2 (2011): 172-174. DOI: 10.1016/j.pubrev.2011.01.004.

The engagement analysis also revealed a progressive increase in users' interactions (RQ2). Focusing on the high number of shares during critical moments, when Italy's epidemiological situation rapidly deteriorated and the infodemic swiftly spread among the populace, is insightful[42]. On one hand, it emphasizes the performativity of LAHs posts, likely due to the crucial subjects they addressed. On the other hand, this aspect highlights the large number of followers who opted to share LHAs' messages, viewing them as reliable and disseminated by a trustworthy source. This communicative hub acted as a multiplier, enhancing the visibility of institutional messages during the pandemic and augmenting the popularity of LHAs' official pages[43]. The high engagement rate of posts dedicated to fake news, though limited in number but with the highest ER, significantly reflects the growing focus on this issue and the intent to counteract it, corroborating similar findings in Italian studies[44].

Furthermore, this sharing process activates the logic of connectivity[45] (RQ3), enabling LHAs to connect with their followers and other institutions by sharing their content. They also employed hashtags, facilitating the broader dissemination of official COVID-19 posts through searchable content streams on Facebook. Such processes unfolded in a timeframe where digital communication supplanted other forms of public health communication, becoming not just a component of the communication mix, but the primary medium. Other studies highlighted the effectiveness of public institutions' communication on social media, particularly when these institutions harness platform-specific logics and collaborate with prominent platform users like celebrities or influencers[46].

Lastly, the importance of content related to citizens' empowerment, which emphasizes advising how they can actively combat the virus, is noteworthy. This awareness of individual responsibility is further bolstered by social media health campaigns. This aspect is interpretable in two ways: on one side, there is an emphasis on individual responsibility, promoting actions like respecting preventive measures and social distancing (e.g., the campaign #iorestoacasa - #Istayathome). On the other side, public health communication advocates collective action against the virus (e.g., the campaign #fermiamoloinsieme - #stopittogether), underscoring the need for collaborative efforts at various levels[47].

6. CONCLUSIONS

This article investigated the use of social media by LHAs in Italy, during the first phase of the COVID-19 pandemic. Findings showed how COVID-19 messages have triggered

[42] Lovari, "Spreading (Dis)Trust. COVID-19 Misinformation and Government Intervention in Italy".

[43] Locatelli, Lovari, "Platformization of Healthcare Communication: Insights from the Early Stage of the COVID-19 Pandemic in Italy".

[44] Lovari, Righetti, "La comunicazione pubblica della salute tra infodemia e fake news: il ruolo della pagina Facebook del Ministero della Salute nella sfida social al COVID-19"; Lovari, Ducci, Righetti, "Responding to Fake News: The Use of Facebook for Public Health Communication during the COVID-19 Pandemic in Italy".

[45] Van Dijck, Poell, "Understanding Social Media Logic".

[46] J.G. Myrick, J.F. Willoughby, "A Mixed Methods Inquiry into the Role of Tom Hanks' COVID-19 Social Media Disclosure in Shaping Willingness to Engage in Prevention Behaviors", *Health Communication*, 37, 7 (2022): 824-832, https://doi.org/10.1080/10410236.2020.1871169; I. Tahamtan *et al.*, "The Mutual Influence of the World Health Organization (WHO) and Twitter Users during COVID-19: Network Agenda-Setting Analysis", *Journal of Medical Internet Research*, 24, 4 (2022): 1-16, https://doi.org/10.2196/34321.

[47] Jacobsen, Vraga, "Improving Communication about COVID-19 and Other Emerging Infectious Diseases".

interactions and engagement rates, increasing public health communication's visibility, and playing a crucial role in citizens' information seeking practices.

This study has some limitations, as it focused on a single geographical area, and did not include every public healthcare organization of the regional territory. Further studies should involve a broader range of public health organizations to provide a more comprehensive view. These studies should also examine if social media communication has evolved post-crisis, using qualitative methods like in-depth interviews. However, this study represents an interesting focus on public health social media communication during a pandemic, particularly in the initial epicentre of COVID-19 in Western countries.

The pandemic acted as an accelerator for public health organizations to deal with and incorporate social media logics, marking a further evolution in the "Health 2.0" framework. The significant influence of these platforms and their algorithms is reshaping the dynamics between institutions, citizens, and the media in both ordinary and crisis contexts.

Nowadays, we are experiencing what might be termed the platformization of healthcare communication[48]. Public health organizations are challenged to adapt, understand the underlying logic, and harness social media's capabilities. Concurrently they should strive to maintain their public mandate, avoiding the pursuit of visibility and popularity at any cost.

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[48] Locatelli, Lovari, "Platformization of Healthcare Communication: Insights from the Early Stage of the COVID-19 Pandemic in Italy".