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Spanish Healthcare Institutions and Their Role in Social Media-Driven Influenza Vaccination Campaigns: A Comprehensive Analysis of X

Pedro Jesús Jiménez-Hidalgo [1,*], Carlos Ruiz-Núñez [2], Beatriz Jiménez-Gómez [3], Sergio Segado-Fernández [4], Carlos Santiago Romero-Magdalena [5], Fidel López-Espuela [6] and Ivan Herrera-Peco [7,8,9,*]

1 Traumatology and Orthopedic Surgery, Hospital Universitario Costa del Sol A-7, Km 187, 29603 Marbella, Spain
2 Facultad de Medicina, Universidad de Málaga, Blvr. Louis Pasteur, 29010 Málaga, Spain; carlos.ruiz@uma.es
3 Nursing Department, Faculty of Medicine, Alfonso X el Sabio University, Avenida Universidad, 1, Villanueva de la Cañada, 28691 Madrid, Spain; beatriz.jimenez@universidadeuropea.es
4 Department of Health Sciences, Universidad Europea de Canarias, Calle Inocencio García, 1, La Orotava, 38300 Santa Cruz de Tenerife, Spain; sergio.segado@universidadeuropea.es
5 Faculty of Health Sciences, Universidad Internacional de la Rioja, Pozuelo de Alarcón, 28224 Madrid, Spain; carlossantiago.romero@unir.net
6 Department of Nursing, Faculty of Nursing and Occupational Therapy, University of Extremadura, Cáceres, 10003 Extremadura, Spain; fidellopez@unex.es
7 Socialhealthcare-UAX Research Group, Faculty of Health Sciences, Universidad Alfonso X el Sabio, Villanueva de la Cañada, 28691 Madrid, Spain
8 Faculty of Health Sciences-HM Hospitals, University Camilo José Cela, Urb. Villafranca del Castillo, 49, Villanueva de la Cañada, 28692 Madrid, Spain
9 Instituto de Investigación Sanitaria HM Hospitales, 28015 Madrid, Spain
* Correspondence: pedrojh@outlook.com (P.J.J.-H.); iherrpec@uax.es (I.H.-P.)

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Abstract: Social media plays a crucial role in health information dissemination, yet it also raises concerns about misinformation. This study examines the role of Spanish health centers in promoting influenza vaccination on social networks, particularly X (formerly Twitter), during the 2023–2024 campaign. An observational, retrospective study analyzed the activity of 832 Spanish health centers on X. Data collection focused on the existence of official accounts, follower engagement and the nature of messages posted. Metrics were obtained using X Analytics, and statistical analysis was performed using JAMOVI v2.4 software. Of the 832 centers, 607 had readable X accounts. Collective accounts were more prevalent (351) than individual ones (239). Collective accounts had significantly more followers and posts but showed less engagement compared to individual accounts. The most followed accounts belonged to public entities, like the Community of Madrid and private organizations, such as Sanitas. An analysis of the vaccination campaign revealed that most posts had a political focus with limited health information, resulting in minimal interaction with the public. As a conclusion, the study highlights the fragmented nature of health communication through social networks in Spain. Despite the higher visibility of collective accounts, their engagement with the public is low, often due to the political nature of posts. A unified national strategy is essential for enhancing public health communication, focusing on interactive and relevant content.

Keywords: health communication; influenza; vaccination; public health campaigns; Spanish health center; social media

1. Introduction

In recent years, social media platforms have become essential tools for public health communication, offering healthcare institutions direct access to large segments of the population (Moorhead et al. 2013). Through platforms like Facebook, X (formerly Twitter), Instagram, and TikTok, these institutions can disseminate health information rapidly

and engage directly with the public (Lupton 2015). However, despite their potential to enhance health communication, significant challenges persist, particularly in ensuring the dissemination of accurate information during public health campaigns, such as vaccination (Zhang et al. 2020).

Social media platforms are powerful tools for health promotion and public education, enabling healthcare institutions to reach diverse populations (Ventola 2014). These platforms allow institutions, including ministries of health and hospitals, to not only disseminate information but also engage directly with the public, addressing concerns and promoting key health measures, such as vaccination (Eysenbach 2020). However, social media also facilitates the spread of misinformation (Bertolami 2022), contributing to the so-called "infodemic" (Casino 2022)—an overload of both accurate and inaccurate health information, leading to public confusion (WHO 2020). A major challenge in using social media for health communication is ensuring the credibility of the information shared. In a context where any user can produce content, distinguishing between reliable health advice and misinformation is increasingly difficult (Briand et al. 2021). Healthcare professionals play a crucial role as trusted sources of validated information (Suarez-Lledo and Alvarez-Galvez 2021). Their involvement in public health campaigns can help ensure the dissemination of credible and accurate health information, thereby countering the spread of myths and misinformation (Herrera-Peco et al. 2021a). This role is particularly significant in vaccination campaigns, where misinformation can contribute to vaccine hesitancy, undermining public health efforts (Dubé et al. 2013). In this context, leveraging healthcare professionals' credibility in social media strategies is essential to building trust and ensuring the success of vaccination campaigns (Herrera-Peco et al. 2021b).

Vaccination remains one of the most effective public health strategies for preventing infectious diseases (Plotkin 2014). Influenza vaccination campaigns are critical in reducing seasonal flu cases, especially among high-risk populations, such as the elderly, young children, and individuals with chronic conditions (Grohskopf et al. 2023). Despite the clear benefits of vaccination, health authorities continue to face challenges in achieving high coverage, particularly considering growing vaccine hesitancy fueled by misinformation (MacDonald 2015).

In Spain, vaccination campaigns are organized and promoted by public health institutions. These campaigns aim to raise public awareness of the importance of vaccination, improve accessibility, and encourage healthcare workers to get vaccinated to protect vulnerable populations (Orenstein and Ahmed 2017). However, the effectiveness of these campaigns depends largely on the communication strategies used. While traditional media outlets have played a central role in disseminating health messages, the rise of social media has created new opportunities and challenges for public health institutions (Gruzd and Haythornthwaite 2013).

Spanish healthcare institutions have been slow to fully integrate social media into their communication strategies. Although some institutions, such as the Ministry of Health, maintain active social media accounts, their use is often limited and lacks the engagement necessary to reach the broader population effectively (Herrera-Peco et al. 2021a; Bermúdez-Tamayo 2010). Furthermore, the decentralized nature of Spain's healthcare system, in which each autonomous community manages its own health services, has led to a fragmented approach to health communication. This lack of consistency in messaging can confuse the public and reduce the overall effectiveness of vaccination campaigns (Casino 2022).

Research indicates that healthcare institutions' social media accounts in Spain often fail to engage the public meaningfully (Martinez-Millana et al. 2017). Most content focuses on administrative updates rather than interactive health communication, which is key to fostering public participation (Busto-Salinas 2021). This limited engagement may contribute to the lower levels of interaction observed on health-related social media accounts in Spain (Herrera-Peco et al. 2021b; Bermúdez-Tamayo 2010).

Given the fragmented nature of health communication in Spain, there is a growing recognition of the need for a unified national strategy that ensures coherent and effective

messaging across regions and institutions (Baraybar-Fernández et al. 2021). A coordinated approach would streamline health communication, ensuring that the public receives consistent, reliable information, particularly during crucial public health campaigns, like influenza vaccination (Sugawara et al. 2020). Additionally, healthcare professionals should be central to this strategy, helping to craft content that enhances trust and engages the public meaningfully (Herrera-Peco et al. 2021a).

A national strategy should also prioritize the use of social media to facilitate real-time engagement with the public. Studies have demonstrated the potential of social platforms to enable healthcare institutions to address public concerns about vaccines and other health topics interactively (Heldman et al. 2013). However, these efforts must move beyond simply broadcasting information (Nichols 2018). Institutions must foster two-way communication that builds public trust and confidence in health interventions, particularly vaccines.

One of the most pressing issues in public health today is vaccine hesitancy, exacerbated by the spread of misinformation on social media (Dubé et al. 2013). Vaccine hesitancy, defined as the delay in acceptance or refusal of vaccines despite the availability of vaccination services, is influenced by various factors, including misinformation and distrust in health authorities (MacDonald 2015; Salathé and Khandelwal 2011). Social media, while a valuable tool for disseminating information quickly, also enables the spread of myths and conspiracy theories that fuel vaccine hesitancy (Suarez-Lledo and Alvarez-Galvez 2021; MacDonald 2015; Salathé and Khandelwal 2011).

Healthcare institutions play a crucial role in addressing misinformation and promoting vaccine uptake. Proactive engagement on social media platforms can help dispel myths, provide accurate information, and foster public trust in vaccination (Zhou et al. 2023). By participating in public discourse, healthcare institutions can address concerns about vaccine safety and efficacy and provide evidence-based responses to misinformation (Reveilhac 2022). However, for these efforts to be effective, healthcare institutions must go beyond simply providing information; it is necessary define the types of messages disseminated, levels of public engagement, and strategies employed to counter misinformation and promote vaccination (Kouzy et al. 2020; Segovia-Villarreal and Rosa-Díaz 2022).

By examining these factors, the present study aims to provide insights into the current state of health communication in Spain and offer recommendations for improving the effectiveness of vaccination campaigns through social media. This study focuses on the role of Spanish healthcare institutions in promoting influenza vaccination during the 2023–2024 campaign, specifically analyzing their activity on the social media platform X. The main objectives of the study are as follows: (i) to assess the number of healthcare institutions with an active presence on social media; (ii) to evaluate the engagement and relevance of these institutions' social media accounts; (iii) to analyze the types of messages shared during the vaccination campaign and their potential impact on the public; and (iv) to determine whether healthcare institutions are effectively using social media to combat misinformation and promote vaccination.

2. Materials and Methods

2.1. Study Design and Ethics

This study employs an observational, retrospective, and time-limited design to analyze discourse on X (former Twitter).

This research was deemed exempt from ethical review as it was conducted on social network and did not involve any manipulation of patient or human data beyond the analysis of Internet activity within the X platform. Furthermore, the study exclusively utilized data from users, official accounts, who had willingly consented on X to share their information publicly, thus avoiding any intrusion into privacy settings. Nevertheless, to adhere to robust research standards on social networks, in the present, no single user account has been used.

2.2. Data Collection

For the selection of Specialized Care health centers in Spain, we used the one provided by the Ministry of Health (updated 2023) on its web page and includes all public and private centers, as well as information on their location (municipality and Autonomous Community) and number of beds.

For these centers, a systematic search was carried out between January and March 2023 within the social network X (Twitter), first checking the existence or not of an official account within it. In those situations, in which the direct search did not yield results, a second search was carried out through the hospitals' web pages, looking for official documents on social network policies.

We also assessed whether the accounts registered as official were unique and specific to each center or whether they were common accounts for several hospitals, a region or a Health Area. A center was defined as having a collective account if (i) its name was present in the account name of X or in the account description or (ii) if there was a link to the collective account on the center's web page.

Inclusion criteria included the following: (i) all active and open accounts belonging to (ii) clinics and specialized care hospitals, (iii) belonging to several hospitals, regions or Health Areas and (iv) belonging to Spain. The following accounts were excluded: (i) accounts associated with Primary Care Centers, Patient Associations or departmental accounts within a hospital, (ii) accounts created by groups of professionals or patients without the support of any institution, (iii) all accounts that were closed or private at the time of data collection and (iv) global collective accounts.

For each account, we analyzed the date of entry into the social network, the number of followers, the number of people following each account, the number of posts or messages on the platform, the number of messages that included multimedia material, such as images or videos, and the number of messages shared by "Likes" or "I like" each account. The administrative data associated with each account were also evaluated: the locality and Autonomous Community to which they belong, the type of center, the Functional Department to which they report and whether it is an account of its own or common to several centers.

We also proceeded to categorize the focus of the messages of the selected quantiles. This categorization was defined as follows: (i) political focus, (ii) institutional focus and (iii) health and/or scientific information. In the first case, messages that only offered opinions of politicians or speeches by politicians were selected. In the second case, messages that did not provide health information and offered telephone numbers or links to web pages for information were included. Finally, messages that provided health and scientific information on vaccination were included. This categorization was carried out by two researchers, and, in the event of possible differences, a third investigator was involved.

The dissemination and reach of health information was assessed using the 2022–2023 flu and COVID-19 vaccination campaign as a measure. For this purpose, an advanced search was performed on Twitter for all posts containing the words "vaccination", "flu" and "COVID-19" made during this campaign, between 20 September 2022 and 30 March 2023. For each of these publications, the number of reposts and citations were recorded as markers of activity, and three ratios were calculated to assess the impact: (i) R1, number of messages per ten thousand users, defined as Potential audience reach; (ii) R2, number of retweets per message, defined as Potential Impact; and (iii) R3, number of citations per message, defined as Engagement.

2.3. Data Analysis

The results were analyzed using the JAMOVI v2.4 software. Statistical significance was established with a random error of less than 5% ($p < 0.05$) and a 95% confidence interval (CI).

Prior to the statistical study, tests were performed to verify the assumptions of normativity, running the Shaphiro–Wilk test to visualize the distribution and the Levene test to

verify homoscedasticity, homogeneity of the variance. The results were suggestive of deviation from normality ($p < 0.01$), so it was decided to perform non-parametric tests for the analysis of results. Comparative analyses between quantitative samples were performed using the nonparametric Mann–Withney U test for independent variables.

Metrics were calculated using X (formerly Twitter) Analytics for the accounts studied, focusing on the potential reach or impressions, which is the number of people who can access the post, the relevance of the account, or the ratio of followers to followers, the interactions made with the post and the participation rate, or engagement, defined as the commitment shown by followers in the form of interactions, compared to individual accounts.

3. Results

3.1. Sample Description

A total of 832 Health Centers in Spain were analyzed, of which 330 (39.66%) belonged to Health Services and Institutes of the Autonomous Communities and 410 (49.28%) belonged to Private Centers or Hospitals. Of the total, 225 centers were not evaluated because they did not present accounts in X, with 607 centers being readable, and of these, 294 were excluded because their accounts were closed or because they were collective accounts (Figure 1).

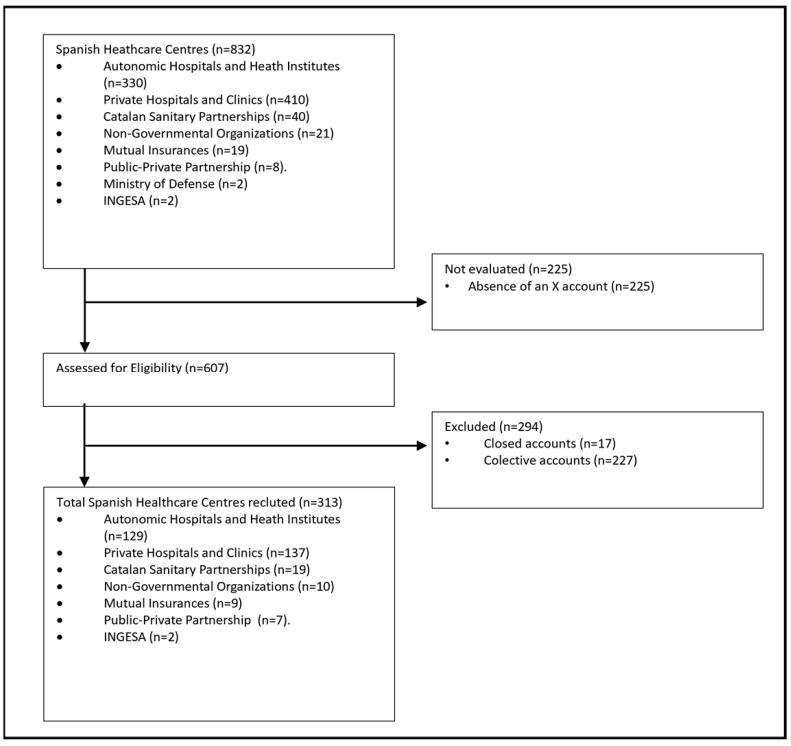


Figure 1. Institution eligibility.

The accounts studied (313) are, on average, 3065 days old, follow 1120 accounts, with 28,980 followers, publish 8047 posts, 2371 with multimedia content and give 4235 likes to their posts (Table 1).

If we look at the type of management of these centers, we observe that 43.6% (137) are privately owned and 41.2% are provided by Services and Institutions of the Autonomous Communities, which are publicly managed.

Table 1. Sample description.

				Shapiro-Wilk	
	Media	**Mediane**	**SD**	**W**	***p***
Days	3065	3287	1213	0.959	<0.001
Following	1120	503	2429	0.394	<0.001
Followers	28,980	2076	131,129	0.206	<0.001
Posts	8047	3859	13,259	0.570	<0.001
Multimedia messages	2371	1099	3597	0.632	<0.001
Likes	4235	1678	8608	0.457	<0.001

When we analyze the X accounts of the healthcare centers, we observe the existence of collective accounts, dependent on a common matrix for all the centers administratively related to that entity. This shows that more centers are represented by a collective account (351 accounts) than those that represent the center individually (239). If we look at management, most individual accounts belong to privately owned centers (112), while collective accounts belong to publicly owned centers (172).

The collective accounts were cleaned so that only one account per organization remained, and 74 accounts with these characteristics were found. If we compare the two, we can see that the collective accounts are superior to the individual ones in all the variables studied, which could be justified by the fact that several health centers are grouped in a single account and represent a larger population, being statistically significant for the number of followers (X2 = 16.35; $p < 0.01$), total tweets or posts (X2 = 18.74; $p < 0.01$), total multimedia files published (X2 = 20.65; $p < 0.01$) and total likes (X2 = 10.96; $p < 0.01$) (Table 2).

Table 2. Description of account stye and institution management.

		Account Type (Institution)		**Institution Management**	
		Individual	**Collective**	**Public**	**Private**
Days	Media (SD) CI95% (Lower–Upper) Me *p*-value	3019 (1217) (2864–3174) 3376 $p > 0.05$	3211 (1195) (2934–3488) 3256	3027 (1230) (2814–3239) 3256 $p > 0.05$	3092 (1203) (2916–3268) 3362
following	Media (SD) CI95% (Lower–Upper) Me *p*-value	1033 (1821) (801–1265) 457 $p > 0.05$	1399(3781) (523–2275) 621	665 (650) (553–777) 495 $p > 0.05$	1447 (3100) (993–1900) 520
Followers	Media (SD) CI95% (Lower–Upper) Me *p*-value	28,626 (134,141) (11,533–45,719) 1576 $p < 0.01$	30,213 (121,753) (1915–58,331) 3303	63,551 (197,752) (29,369–97,733) 2780 $p < 0.01$	4096 (8058) (2917–5275) 1157
Posts	Media (SD) CI95% (Lower–Upper) Me *p*-value	7056 (12,967) (5403–8708) 11,249 $p < 0.01$	11,249 (13,768) (8059–14,438) 7658	11,984 (18,266) (8826–15,141) 5595 $p < 0.01$	5214 (6642) (4242–6185) 2607
Multimedia messages	Media (SD) CI95% (Lower–Upper) Me *p*-value	1941 (2972) (1562–2320) 949 $p < 0.01$	3758 (4892) (2625–4892) 2417	2915 (4416) (2152–3678) 1234 $p > 0.05$	1979 (2815) (1517–2390) 953
Likes	Media (SD) CI95% (Lower–Upper) Me *p*-value	3486 (5446) (2792–4180) 1389 $p < 0.01$	6652 (14,568) (3277–10,028) 2787	5015 (7787) (3669–6361) 2548 $p < 0.01$	3673 (9132) (2338–5009) 1319

The privately managed centers have been present in the social network for longer and keep more accounts. On the other hand, public centers post more multimedia content, and the difference in favor of public centers in number of likes (X2 = 11,171; $p < 0.01$), number of followers (X2 = 18,875; $p < 0.01$) and publications (X2 = 15,927; $p < 0.01$) is statistically significant, doubling that of privately managed centers. Finally, the largest number of accounts belonged to private individual accounts (146), public individual accounts (93), public collective accounts (38) and private collective accounts (36). (Table 2).

Studying the information provided by the metrics in relation to the type of center management (grouped into public and private, as developed above), it can be seen that the individual accounts show greater scope (X2 = 18.875; $p < 0.001$), potential impact (X2 = 15.9277; $p < 0.001$), being statistically significant in both cases, and engagement, than comparing them with the results of the collective accounts (Table 3).

Table 3. Assessing the impact in relation to account type and institution management.

		Account Type (Institution)		Institution Management	
		Individual	**Collective**	**Public**	**Private**
Followers—Potential audience reach	Media (SD) CI95% (Lower–Upper) Me *p*-value	28,625.7 (134,140.5) (11,532.5–45,718.9) 1576 $p < 0.01$	30,122.9 (121,753) (1915–58,330.7) 3303	63,550.8 (197,751.8) (29,369.1–91,732.6) 2780 $p < 0.01$	4096 (8057.9) (2917.5–5274.6) 1157
Potential Impact	Media (SD) CI95% (Lower–Upper) Me *p*-value	7055.8 (12,967.2) (5403.4–8708.2) 2779 $p < 0.01$	11,248.7 (13,767.7) (8059–14,438.4) 7657.5	11,983.6 (18.266) (8826.3–15,140.9) 5595 $p < 0.01$	5213.7 (6642) (4242.3–6185.2) 2606.5
Engagement	Media (SD) CI95% (Lower–Upper) Me *p*-value	64.2 (71.1) (54.9–73.5) 46.6 $p > 0.05$	58.6 (53.2) (46.2–71.1) 40.9	65.1 (67.4) (53.2–77) 47.9 $p > 0.05$	61.2 (67.1) (51.2–71.2) 45.8

Considering the collectivity of the accounts, collective accounts have a greater reach (X2 = 16.3538; $p < 0.001$) and potential impact (X2 = 18.7367; $p < 0.001$), both statistically significant. However, they have less engagement compared to the individual accounts (Table 3).

In the analysis of the 10 most representative accounts, according to age, the first corresponds to the collective corporate account of the private healthcare company Sanitas (@Sanitas), founded in September 2008, followed by the official account of the Hospital Clinic de Barcelona (@hospitalclinic), created almost a year later, in May 2009, and the corporate account of the Servicio Riojano de Salud, which brings together the public hospitals of the region (@riojasalud), opened in August 2006 (Table 4).

Table 4. Top ten Spanish accounts opened in chronological order in social network X, associating the number of followers and publications.

Institution	Location	Institution Management	Account Name	Date of Entry in X	Followers	Total Posts
Sanitas		Private	@sanitas	June 2008	40,700	17,100
Hospital Clinic de Barcelona	Barcelona	Public	@hospitalclinic	May 2009	61,200	24,300
Rioja Salud	La Rioja	Public	@riojasalud	August 2009	7823	9112
Fundación CUDECA. Centro de cuidados paliativos	Benalmádena	Public	@cudeca	November 2009	3255	3276

Table 4. *Cont.*

Institution	Location	Institution Management	Account Name	Date of Entry in X	Followers	Total Posts
Consorcio Hospital General Universitario de Valencia	València	Hospitales Generales	@hguvalencia	December-09	11,364	15,579
Hospital Universitari Son Espases	Palma	Hospitales Generales	@sonespases	January 2010	9482	7246
Comunidad de Madrid	Comunidad de Madrid	Comunidad Autónoma	@comunidad-madrid	March 2010	746,200	68,100
Clinica Creu Blanca	Barcelona	Hospitales Generales	@creublanca	April 2010	733	3360
Centre Sociosanitari de L'Hospitalet—Consorci Sanitari Integral	Hospitalet de Llobregat	Hospitales de media y larga estancia	@consorcicsi	May 2010	3298	2845
Clinica SEAR	Madrid	Privado	@clinicasear	June 2010	15	13

When assessing the number of followers (Table 5), the account with the highest number of followers was the account of the Community of Madrid (@comunidadmadrid), with 746,200 followers.

Table 5. Ten Spanish accounts with the highest number of followers in social network X, associating date of entry and publications.

Institution	Location	Institution Management	Account Name	Date of Entry in X	Followers	Total Posts
Comunidad de Madrid	Comunidad de Madrid	Public	@comunidadmadrid	March 2010	746,200	68,100
Cruz Roja Española		Privado	@CruzRojaEsp	April 2011	129,200	45,500
Sistema Canario de Salud	Canarias	Public	@SanidadGobCan	September 2019	64,800	14,600
Hospital Clinic de Barcelona	Barcelona	Public	@hospitalclinic	May 2009	61,200	24,300
QuironSalud		Privado	@quironsalud	January 2015	54,100	30,800
Hospital Universitari Vall D'Hebron	Barcelona	Public	@vallhebron	October 2012	47,100	46,700
Salud Castilla y León (SACYL)	Castilla y León	Public	@Salud_JCYL	November 2011	41,600	44,000
Sanitas		Private	@sanitas	June 2008	40,700	17,100
Osakidetza—Servicio Vasco de Salud	País Vasco	Public	@osakidetzaEJGV	December 2010	33,605	13,904
Hospital Sant Joan de Deu	Barcelona	Public	@SJDbarcelona_es	May 2010	27,000	13,700

This account is defined as the Official Profile of the Community of Madrid, being the account of the Madrid Health Service, Salud Madrid (@SaludMadrid) the official account of public health in the Autonomous Community, despite the existence of an account of the Madrid Health Service. This is because all public hospitals in the Community have their X accounts blocked and redirected to the Community's account.

The second account with the highest number of followers was the Spanish Red Cross account (@CruzRojaEsp), with 129,200 followers. This account, in addition to other informa-

tion about the Non-Governmental Organization, includes the Red Cross Central Hospital in Madrid and the Red Cross Hospital in Bilbao.

These are followed by the account of the Canary Health Service (@SanidadGobCan) with 64,800 followers, the Hospital Clinic of Barcelona (@hospitalclinic) with 61,200 and the corporate account of the Group QuirónSalud (@quironsalud) with 30,200 followers.

If we consider the potential impact of its publications, the account of the Community of Madrid would be the first, with 50,816,200 k potential impressions, followed by the Spanish Red Cross with 5,878,600 k, Hospital Universitari Vall D'Hebron with 2,199,600 k, Salud Castilla y León (SACYL) with 18,304 k, QuirónSalud with 1,666,300 k and Hospital Clinic de Barcelona with 1,487,200 k potential impressions (Table 6).

Table 6. Ranking of accounts with the highest number of followers ordered by minimum reach.

Institution	Followers	Posts	Potential Audience Reach
Comunidad de Madrid	746,200	68,100	508,162 k
Cruz Roja Española	129,200	45,500	58,786 k
Hospital Universitari Vall D'Hebron	47,100	46,700	21,996 k
Salud Castilla y León (SACYL)	41,600	44,000	18,304 k
QuironSalud	54,100	30,800	16,663 k
Hospital Clinic de Barcelona	61,200	24,300	14,872 k
Sistema Canario de Salud	64,800	14,600	9461 k
Sanitas	40,700	17,100	6960 k
Osakidetza—Servicio Vasco de Salud	33,605	13,904	4672 k
Hospital Sant Joan de Deu	27,000	13,700	3699 k

The rest of the accounts in the list do not exceed 1,000,000 K potential reaches (Table 6). Of these, we find that seven are collective accounts and two belong to private entities and one to a non-governmental organization.

3.2. Vaccination Campaign Analysis

Focusing on a specific intervention to assess the health activity of these accounts, we studied the 2022–23 vaccination campaign (Table 7), analyzing descriptive variables of the accounts, as well as various metrics that allow us to establish the real activity of these accounts.

Table 7. Top 10 vaccination campaign metrics.

Account	Followers	Following	Posts	Reposts	Citations	Interactions	Relevance	Impressions	Ratio of Participation (%)
@hospitalclinic	61,200	6090	48	256	31	5.98	0.100	2,937,600	0.010
@SanidadGobCan	64,800	132	30	210	185	13.17	0.002	1,944,000	0.020
@Salud_JCYL	41,600	23	29	48	5	1.83	0.001	1,206,400	0.004
@osakidetzaEJGV	33,605	74	27	120	76	7.26	0.002	907,335	0.022
@comunidadmadrid	746,200	702	9	278	399	75.22	0.001	6,715,800	0.010
@quironsalud	54,100	30,200	6	8	2	1.67	0.558	324,600	0.003
@SJDbarcelona_es	27,000	908	4	7	1	2.00	0.034	108,000	0.007
@CruzRojaEsp	129,200	657	1	3	1	4.00	0.005	129,200	0.003
@vallhebron	47,100	1889	1	23	2	25.00	0.040	47,100	0.053
@sanitas	40,700	1366	1	4	0	4.00	0.034	40,700	0.010

If we study followers, @comunidadmadrid with 746,200, @CruzRojaEsp with 129,200 and @SanidadGobCan with 64,800, are the most followed. On the opposite side, in the following of other accounts, we find leading @quironsalud with 30,200 followed, @hospitalclinic with 6096 and @vallhebron with 1889. It is also @comunidadmadrid that has the most potential impressions (6,715,800), followed by @hospitalclinic (2,937,600) and @SanidadGobCan (1,944,000).

It is precisely @hospitalclinic the account that has posted the most, with 48 posts about the vaccination campaign, followed by @SanidadGobCan with 30 and @Salud_JCYL with 29.

The account that has had the most interactions is @comunidadmadrid, with 75.22 per post, followed by @vallhebron with 25 and @SanidadGobCan with 13.17. The rest of the accounts do not reach an interaction per post higher than 10.

By relevance of the accounts, or ratio of followers to followers, the first would be @quironsalud, followed by @hospitalclinic and @valhebron.

The highest rate of participation, or engagement, was @valhebron with 0.053%, followed by @osakidetzaEJGV (0.022%) and @SanidadGobCan (0.20%).

3.3. Analysis of Vaccination Campaign Messages

An analysis of the typology of the messages sent by these accounts shows that the information given by most of the messages is merely political, with very few sanitary or scientifically relevant data shared (Table 8).

Table 8. Description of posts on vaccination and their approach to the population.

	Posts	Interaction with Users' Accounts	Messages Approach		
			Political Focus	Institutional Information	Health/Scientifics Information
@ComunidadMadrid	9	0	6 (66.7%)	2 (22.2%)	1 (11.1%)
@CruzRojaEsp	1	0	1 (100%)	0	0
@SanidadGobCan	30	0	10 (33.3%)	20 (66.7%)	0
@hospitalclinic	44	0	33 (75%)	3 (6.8%)	8 (18.2%)
@quironsalud	5	0	3 (60%)	0	2 (40%)
@Salud_JCYL	29	0	13 (44.8%)	15 (51.7%)	1 (3.4%)
@Sanitas	1	0	1 (100%)	0	0
@ osakidetzaEJGV	25		8 (32%)	7 (28%)	10 (40%)
@SJDBarcelona_es	4	0	1 (25%)	1 (25%)	2 (50%)

No messages that generated interactions with users were observed, i.e., generated conversation and responded to possible doubts and queries from citizens. Likewise, it was observed that all the accounts analyzed offered messages with a clear political focus, representing 51.35% of the total messages, to the detriment of messages with a clear focus on health or scientific information, which represented 16.22% of the total messages. Finally, it can be observed that institutional information messages represented 32.43% of the total.

Regarding the individual account analysis, we found that among the publicly managed accounts, there is a significant presence of politically toned messages. Specifically, @hospitalclinic had 75% of its messages with a political tone, and @ComunidadMadrid had 66.7% of its messages with a similar tone. In terms of messages with scientific and health-focused content, the accounts with the highest amount of such content were the publicly managed @osakidetzaEJGV and the privately managed @quironsalud, both with 40% of their messages containing scientific or health-related information (Table 8).

Finally, the analysis of messages providing institutional information showed that the account @SanidadGobCan offered 66.7% of its messages with such content, followed by @Salud_JCYL with 51.7%, both representing public entities (Table 8).

4. Discussion

To the authors' knowledge, this is the first study focused not so much on the presence of health institutions in Spain in the social network X, but also on their participation and

interaction with the population in a specific public health campaign, such as vaccination against influenza.

When analyzing the number of institutions that are present in the X social network, it is important to highlight that the fragmentation in the management of health information in social networks in Spain is evident, with different models for each Autonomous Community, region or center. This diversity translates into a mixture of centralized, regional and specific accounts for certain hospitals. This decentralized model could contribute to less efficiency and coherence in health communication, affecting the ability of the institutions to reach the population in a uniform manner (Busto-Salinas 2021). Furthermore, it has been observed that in times of a health crisis, such as the COVID-19 pandemic, communication strategies in social networks vary significantly between the central government and autonomous authorities, which can lead to uneven information propagation (Herrera-Peco et al. 2021a, 2021b; Busto-Salinas 2021).

In this regard, it is important to define that, with respect to the fragmentation observed, it was already described in previous studies, such as Sugawara et al. (2020), who analyzed the relevance of accounts in Japan based on the number of followers. This study found that 1211 accounts had more than 500 followers, whereas in Spain, only 230 accounts out of 255 centers reached this threshold. This disparity underscores the need for a more unified and coherent strategy for managing health information in social networks (Segovia-Villarreal and Rosa-Díaz 2022). Similarly, Bermúdez-Tamayo (2010) described the early stages of social media adoption by Spanish hospitals, highlighting significant differences in usage across regions and types of hospitals, which further emphasizes the fragmented nature of social media strategies in healthcare (Martinez-Millana et al. 2017). Additionally, García-Méndez et al. (2022) evaluated the quality of health-related social network accounts in Spain, acknowledging its increasing importance, especially after the COVID-19 pandemic, as a tool for improving and promoting health. They identified significant disparities in content effectiveness and accessibility (Segovia-Villarreal and Rosa-Díaz 2022). These findings collectively highlight the ongoing challenges and the critical need for a more standardized approach to health communication in social networks (Plotkin 2014; Korda and Itani 2013).

Of the centers analyzed, almost 30% were not represented on the X social network, increasing to more than 70% if only centers with their own accounts are counted. This lack of presence significantly limits the ability of the centers to interact with the public and disseminate health information effectively. The low representation could be due to a lack of resources or knowledge about social network management within healthcare institutions, highlighting the need to train and allocate adequate resources for digital health communication (Plotkin 2014; Korda and Itani 2013). The great heterogeneity among the accounts of healthcare centers is remarkable. Despite posting an average of 2.6 tweets per day, accounts only have an average of 3000 followers, showing great variability. This disparity in activity and reach suggests that not all accounts use best practices to attract and maintain followers. According to Moorhead et al. (2013), the effective use of social media in healthcare can significantly improve engagement and reach if appropriate digital communication strategies are implemented (Plotkin 2014; Kata 2012).

In relation to the importance and interaction with the users, the population that have these accounts, the present study shows that collective account models tend to have better results in terms of the number of followers and likes. However, when these results are adjusted for the number of accounts, no significant advantage is observed in terms of reach and engagement. This finding suggests that collective accounts, while more visible, do not necessarily achieve greater interaction with the public. It is crucial that collective accounts develop more engaging and relevant content to maintain follower interest (Plotkin 2014).

The analysis of individual accounts shows that the accounts with the highest number of followers tend to be collective, corresponding to Health Services or Private Companies, while only three correspond to hospitals, all in Barcelona. These accounts show low activity in health and preventive medicine communication. For example, during the flu campaign,

the updating and relevance of the information transmitted was low, with a limited scope of the information shared (Moorhead et al. 2013). Studies by Busto-Salinas (2021) and Mata-Gómez et al. (2018) have confirmed similar findings, indicating that hospitals in Spain often have less active social media accounts compared to private companies and health services, and their engagement in health promotion activities is minimal. Furthermore, Martinez-Millana et al. (2017) observed that while Spanish hospitals have a significant online presence, their use of social media for active communication and public engagement remains limited. Furthermore, Segovia-Villarreal and Rosa-Díaz (2022) also highlighted the importance of improving the quality and frequency of health-related posts to enhance public health outcomes.

Many collective accounts are used for multiple purposes, not only health, but also political or administrative, as in the Community of Madrid or companies, such as Quiron-Salud and Sanitas. This multifunctional use can dilute the health message and reduce the effectiveness of health communication. It is essential that health accounts maintain a clear and consistent focus on health information to maximize its impact (Ventola 2014).

It is important to highlight the scarce interaction from institutional accounts with users' accounts in the X social network. These interactions, which are so often between health institutions and the public on social media, are a significant issue that undermines the effectiveness of health communication strategies. Studies have shown that health-related social media accounts managed by institutions tend to have low levels of engagement with their audiences, which can lead to a lack of trust and diminished public interest in the information provided. Martinez-Millana et al. (2017) found that while many Spanish hospitals have an online presence, their social media interactions are limited, particularly on platforms like Facebook and Twitter. This lack of engagement means that important health messages may not reach or resonate with the intended audience, reducing the overall impact of public health campaigns. Reveilhac (2022) noted that social media posts by health authorities often lack interactive elements, such as responses to comments or engagement with users' concerns. This creates a sense of distance between the institutions and the public, making it less likely that individuals will feel heard or valued. Effective communication on social media should involve a two-way dialogue, where institutions actively listen and respond to the public's needs and feedback. This not only helps build trust but also ensures that the information provided is relevant and useful (Anwar et al. 2020). Furthermore, Busto-Salinas (2021) emphasized that hospitals and health services with higher engagement levels on social media tend to be those that provide timely, relevant, and interactive content. However, the study also pointed out that many institutions fall short in these areas, often posting infrequent updates that fail to address current health concerns or engage with the public in meaningful ways. This lack of timely and relevant communication can lead to decreased public interest and trust in institutional social media accounts (Zhou et al. 2023; Reveilhac 2022).

The issue of politicization in health communication by institutions on social media is increasingly problematic. Studies indicate that health information disseminated by political authorities and health organizations is often influenced by political agendas, which can undermine public trust and engagement. For instance, the politicization of health topics, such as the COVID-19 vaccine, has been shown to create divisions and reduce the effectiveness of health campaigns. Zhou et al. (2023) highlighted that U.S. politicians heavily politicized COVID-19 vaccine discussions on social media, contrasting with the more factual communication by medical experts. This politicization can lead to a significant reduction in public trust, as people perceive the information as biased and agenda-driven rather than based on scientific evidence (Zhang et al. 2020).

The impact of this politicization is further compounded by the low level of interaction between institutions and the public. There exists little correlation between the engagement levels of social media posts by health authorities and the public's trust in these authorities (Gonzalez-Polledo 2018). This lack of interaction can lead to a sense of disconnection and distrust among the public, as they feel their concerns and questions are not being

adequately addressed. This is especially critical during health crises when clear, trustworthy communication is vital for ensuring public compliance with health measures (Zhou et al. 2023; Anwar et al. 2020).

Furthermore, the study by Gonzalez-Polledo (2018) suggests that the overly politicized nature of health communication can create an environment where misinformation thrives, as polarized discussions overshadow factual, science-based information. This environment not only hampers effective health communication but also fosters public skepticism and disengagement from health initiatives (Ma et al. 2022). For example, the unified strategy in media communication on the COVID-19 pandemic by the CDC (Centre for Disease Control) in de U.S.A and the U.N. was shown to have more impact on hygiene and health practices (Anwar et al. 2020).

Finally, it should be noted that this study has several limitations, mainly related to the study design, which was cross-sectional. Secondly, the participant selection criteria, such as having used only X social network, so the detection of users as potential participants in the present study. Furthermore, retrieving information using a specific hashtag and keyword may have missed users who posted messages without using these keywords.

5. Conclusions

This study identified significant challenges in the management of health communication through social networks in Spain, particularly in the influenza vaccination campaign. Fragmentation in the management of health information, with centralized, regional and hospital-specific accounts resulted in less efficient and coherent communication. This diversity, which became more apparent during the COVID-19 pandemic, affects the ability of institutions to uniformly reach the population. Compared to countries like Japan, where social media strategies are more cohesive, Spain shows a less effective adoption and use of these platforms, despite the population's growing reliance on real-time information.

The low representation of health centers on social networks, with only 30% pre-existing and less than 70% with their own accounts, severely limits the capacity for interaction and the dissemination of health information. This deficit seems to be linked to a lack of resources or knowledge in social network management, emphasizing the need for training and proper resource allocation for digital health communication.

Regarding the accounts of healthcare centers, it is important to highlight their heterogeneity but also their varying reach among the population, suggesting a lack of best practices to attract and retain followers. Although collective accounts tend to have more followers and likes, they do not necessarily achieve greater interaction when adjusted for the number of accounts. This indicates that collective accounts need to develop more engaging and relevant content. Furthermore, many collective accounts have multifunctional uses that dilute the health message, reducing the effectiveness of health communication. The limited interaction of institutional accounts with users undermines the effectiveness of health communication strategies, creating a sense of distance between institutions and the public. It is crucial that communication on social media involves a bidirectional dialogue to build trust and ensure the relevance of the information.

Although new studies are needed to analyze the content of information in social network accounts and determine whether there are a low number of followers and identify the best practices for health communication in social networks and develop strategies to improve public outreach and engagement, in this sense, the need to develop a unified national strategy for communication in social networks that ensures coherence and efficiency in the dissemination of health information, allowing for a uniform and effective interaction with the population, is proposed, without forgetting to enhance the interaction with the population, addressing, for example, the creation of more attractive and relevant content, but without forgetting to promote greater interaction with users through responses to comments and attention to user concerns.

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