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Trends in the interest in COVID-19 news of the local media and their readers: the case of Spain

The COVID-19 has caused not just an unprecedented sanitary crisis but a social crisis, which has affected, among many other fields, the local journalism, which had to adapt to meet the public's information needs about coronavirus. In this study we analyzed the evolution of local news about COVID-19 in Spain throughout the pandemic by examining local news articles in social media. Using a unique dataset of over 230k Facebook posts published by Spanish local media organizations during 2020 and 2021, we found evidence that the interest of local media in COVID-19, measured as the proportion of the news related to COVID-19, changed as the pandemic evolved. Our results also show that the interest that local media readers had in COVID-19, measured as the proportion Facebook interactions related to COVID-19, was even higher, and also evolved during the pandemic. Although the interest in COVID-19 of local media and their readers essentially progressed in parallel, we also identified some periods in which they behaved differently. While a fatigue with COVID-19 related news would be expected after two years of pandemic, a clear decrease of interest was not observed neither in journalists nor in readers.

Keywords: local journalism, COVID-19, news fatigue, news avoidance, public engagement, social media, Facebook, Spain.

Introduction

The emergence of the COVID-19 since 2020 has resulted in hundreds of millions of people infected and millions of deaths worldwide, but has also brought about a profound disruption in the way of life of the people. Both journalism in general and local journalism have also been affected by those changes, forcing many outlets to implement teleworking and virtual communication systems in order to adapt to the periods of confinement and restrictions to social activity (Olsen, Pickard and Westlund, 2020; Garcia-Avilés, 2021; Castriota and Delmastro, 2021; Joseph et al., 2021). At first, little was known about the

disease, and public health officials and governments were fighting against the rampant misinformation spreading through internet and social networks (e.g., Evanega et al., 2020; Noar and Austin, 2020). In this scenario is exactly when the proximity and trust in local journalism is most essential as a reliable source of news to meet the public's information needs. In order to understand how those information needs were fulfilled during the coronavirus pandemic, we had to study what information was being published, how the public received it and how those two varied through time. Many researchers have investigated the information environment surrounding COVID-19, showing significant differences in how newspapers covered the pandemic. There is a large body of literature around the production and consumption of COVID-19 news by national media (García-Avilés, 2021; Masullo, Jennings and Stroud, 2021). However, those issues have been barely explored in relation to local media (Castriota and Delmastro, 2021; Joseph et al., 2021; Hess and Waller, 2021) despite the fact that local media has played a crucial role during the COVID-19, and has been considered one of the most reliable source of coronavirus news by many (Schulz, 2021; Shearer, 2020).

This work aims to contribute to fill this gap by studying how the interest of local newspapers and their readers in COVID-19 evolved during the 2020-2021 pandemic in Spain. In particular, our goals were threefold: we first evaluated how the proportion of news related to COVID-19 in local newspapers evolved during the pandemic in Spain (RQ1). This is important as it measures whether the interest of the local media in coronavirus news changed as the pandemic evolved. Second, (RQ2) we analyzed the evolution of the public participation, given by the proportion of Facebook interactions that were associated to COVID-19 related news (García-Perdomo et al., 2018; Weber, Andringa and Napoli, 2019; Toff and Mathews, 2021). This is relevant as it can shed light on whether the audience interest in COVID-19 progressed throughout the pandemic.

Finally, we also look at dynamics of those two measures (RQ3), *i.e.*, we investigated how the volume of local news about COVID-19 and the corresponding interactions of the readers in social media correlated throughout the pandemic and, in particular, during important events of the epidemic (*e.g.*, lockdowns or the different waves).

We frame our analysis in the context of local journalism as it plays a critical role in keeping the public properly informed. Local news organizations are currently under immense financial pressure (Jenkins and Nielsen, 2020; Olsen, Pickard and Westlund, 2020) and if they are to survive, then they need to understand the dynamics of local news consumption, evaluation, and dissemination in social media (Toff and Mathews, 2021; Olsen, 2021; Thorson et al., 2020; Almgren, 2017). A cataclysmic crisis like the COVID-19 presents a cogent opportunity for doing so. Our study case is focused in Spain since, historically, the local press has played a central role in the country and is one of the largest countries most severely affected by the coronavirus pandemic.

The role of local journalism in society

Local media cover events and topics on a small and local scale that would usually not be followed by larger mainstream media. As a result, local journalism has always been an essential part of local life and has shown to have the capacity to impact in the opinion and behavior of local audiences (Kim, Shepherd and Clinton, 2020; Hayes and Lawless, 2015) which makes local media essential organizations to spread critical and reliable information. According to Oppegaard and Rabby (2016) proximity is one of the most powerful factors when choosing news and local journalism can take advantage of the contextual awareness and exploit the potential of proximity to impact on key factors such as public engagement or trust.

However, in recent years, local media have been severely affected by the plummet in local advertising spending, a broken business model and the rise of digital platforms that refuse to pay for content (Olsen, Pickard and Westlund, 2020; Harte Howells and Williams, 2018). The Internet has greatly changed the way the local press operates triggering profound disruptions in the traditional models of journalism, forcing radical adaptations in the newsrooms and in the relationship of the media with their audiences. One of the most obvious disruptions has been the widening of the boundaries for the dissemination of news content, enabling local journalism to have a global dissemination. However, several studies have revealed that the globalization of journalism shows some nuances characteristic to each country, region and even to each community (Almgren, 2017; Olsen, 2021). In fact, it has been long documented that even though globalization tends to homogenize the content of media, local specificities survive in online news markets (García-Perdomo et al., 2018).

The collapse of the local news media is a significant threat to the production of reliable information at a time when it is most needed that could damage local democracy and leave local audiences under-informed. The local nuances that persist in each region can be beneficial to the maintenance and stability of the local press. Hence, the cultivation of proximity with the local readers and the preservation of identity, cultural and historical ties can play a crucial role to compete with more general media (Oppegaard and Rabby, 2016).

The COVID-19 crisis has caused a significant disruption in the way journalism operates and forced journalists worldwide to change their working procedures (García-Avilés, 2021). This has further exacerbated existing problems in the local media industry, forcing them to quickly adapt their editorial processes to meet the needs of online audiences. In fact, during the pandemic, many local newspapers have been hit hard and

announced they could no longer keep their presses running despite the increase in demand for credible news (McMullan, 2021; Hess and Walker, 2020; Olsen, Pickard and Westlund, 2020). At the beginning of 2020, with the onset of the pandemic, the information supply on COVID-19 was characterized by confusion and misinformation (Evanega et al., 2020; Noar and Austin, 2020). While the number of media spreading conspiracy theories and fake news was rampant, local media was used by public health officials and politicians to communicate the most essential public health policies to local communities (Shearer, 2020). In fact, local media has been repeatedly considered one of the most reliable sources for coronavirus information, and many citizens relied on them for information about the disease in their area (Schulz, 2021; Frank, 2020; Olsen, Pickard and Westlund, 2020). For example, in the U.S. nearly half of U.S. adults (46%) considered local news outlets as a major source for COVID-19 news (Shearer, 2020; Schulz, 2021).

Social media interactions

In such a competitive media market, in which traditional media organizations struggle to gain the interest of consumers, it is important to examine how readers engage with the news in local media. Social media, due to its openness and interactive nature, provides an optimal platform for a participatory communication between journalists and public (Park and Kaye, 2021). For this reason, social media have become increasingly important in the new local news ecosystem, and audience participation plays a fundamental role in disseminating and evaluating local news content (Perez-Vega, Waite and O'Gorman, 2016; Bright, 2016). Better understanding of what types of stories are shared, liked or commented the most on social media platforms can help to shed light on when media is connecting with the masses, posting stories that engage and capture readers. Facebook,

being the most utilized social network, is the dominant platform to access local news and has become a crucial influence over news dissemination (Thorson et al., 2020; Almgren, 2017). Moreover, the effect of incidental exposure on Facebook is less strong than in other social networks like Twitter or YouTube (Fletcher and Nielsen, 2018). Research has focused on users as news disseminators, and the way by which they share news on Facebook indicates if a particular local news has been promoted (Weber, Andringa and Napoli, 2019; Masullo, Jennings and Stroud, 2021).

One of the most far-reaching consequences of the COVID-19 pandemic has been a significant increase in the use and the reliance on social networks (Van Aelst et al., 2021; Pérez-Escoda et al., 2020). This suggest that, in times of a great need for information, citizens tend to turn to news sources that offer an instant coverage and are easily available, such as social networks (Van Aelst et al., 2021). Interactions such as shares, comments or likes of posts of news, have become a valuable source for researchers to gauge the audience evaluation and dissemination of news. Several scholars have studied the impact of Facebook on journalism at the national level, see for instance (Park and Kaye, 2021; Carlson, 2018). However, much less research has been done on Facebook use in the local news context, despite the fact that local news media come out top when it comes to seek out local information about Coronavirus (Schulz, 2021). According to Thorson et al. (2020), local news media are increasingly displaced from the center of local political information infrastructures, while Facebook moves to take up a central infrastructural role. In fact, as Facebook has captured more and more online traffic, the company has also been accused of being one of the main factors of the crisis of the local media (Toff and Mathews, 2021). So, it is not surprising that in the last decade, the news industry has devoted considerable resources to attract consumers on social media platforms and publishing free content on these digital platforms has become a

common practice. For instance, news editors have reported that they carefully design which articles will be posted on their Facebook in order to maximize internet traffic, and increase readers' engagement through interactions like shares, comments, and likes (Thorson, 2020).

Goals and research questions

This article attempts to provide an analysis of local news coverage of COVID-19 by exploring how local news media and users have been sharing news about COVID-19 during the 2020-2021 pandemic in Spain. This fills the gap in research of the coverage of local media news about COVID-19 and the corresponding public engagement through Facebook. We consider a measure of public engagement based on Facebook's reactions (shares, comments, likes, loves, Ha-has, etc.) for the news articles about COVID-19 to estimate the interest of the audience, following previous engagement measurements in the literature (Lev-On and Steinfeld, 2015; García-Perdomo et al., 2018; Weber, Andringa and Napoli, 2019; Toff and Mathews, 2021). For these reasons we post the following research questions.

RQ1: How does the percentage of local news articles about COVID-19 shared in Facebook evolve throughout the 2020-2021 COVID-19 pandemic in Spain?

RQ2: How does the percentage of Facebook interactions about COVID-19 related news evolve throughout the 2020-2021 COVID-19 pandemic in Spain?

News Fatigue

The concepts of news fatigue and information overload have emerged to understand certain aspects of news avoidance, *i.e.*, when readers stop consuming news due to excessive media coverage of a topic during a period of time (Edgerly, 2021). While there

has been considerable research into news consumption, the concepts of news fatigue and information overload have mostly been investigated in recent years (Groot Kormelink and Klein Gunnewiek, 2022; Gurr, 2022). Interestingly, the fatigue of the media has been even less investigated. Thus, it would be interesting to evaluate whether news fatigue in relation to COVID-19 occurred in consumers and media during the first two years of the pandemic in Spain.

The coverage gap of media and readers

There is a large body of research on the coverage gap between what the public sees as its information needs and what journalism provides. It has been well-documented that the media tries to feed the public with valuable content (the hard news) while the audiences look for soft sensational news that entertains them (Boczkowski and Mitchelstein, 2017; Thompson, 2014).

The fast-growing competition has been pressuring the media outlets to pay more attention to readers' preferences and this, in turn, has compelled them to modify their supply of news toward softer news. For this reason, researchers have often identified market forces as a critical driver in this *softening of news* phenomenon. Although researchers have argued whether these changes narrow the gap by providing readers more of what they allegedly search, or create another gap by neglecting what could be regarded as critical information, there is a growing consensus that the news have "gone soft" (Boczkowski and Mitchelstein, 2017). Such prevalence of soft news together with the strong consumer involvement in the production of news, have raised serious questions about the ability of media companies to contribute to the quality of democratic life, wondering whether media outlets might be pandering to the masses, publishing news whose only value lies in their ability to attract consumers and revenue (Jenkins and

Nielsen, 2020). This issue is particularly important in the context of local news, as local media plays an essential public service within the local communities. Hence, it is important to understand how local media deals with such dichotomy between serving the public to financially survive while carrying out their central role of providing quality journalism. In the first research question posted in this work we looked at the coverage of the COVID-19 pandemic by the local media, and in the second question we observe the interest of the public in this news. The analysis of the correlation of these two variables can shed light in the complex dynamics of news preferences of local journalists and consumers. This leads immediately to the third research question which is related to the assessment of possible differences in the interest in COVID-19 news between the local media and the readers of those local newspapers.

RQ3: Is there a difference between the percentage of local news articles about COVID-19 shared in Facebook in Spain and the percentage of Facebook (FB) interactions that are related to those COVID-19 articles, and are these percentages somehow correlated with each other?

The conceptual benefits of investigating this question derive from a better understanding of what a supply of COVID-19 related news consists of, and of exactly how the news choices of local media and readers diverge. Also, it allows to evaluate whether the local media interest in COVID-19 was somehow driven by the interest that local media readers had in COVID-19, or the opposite, the interest of readers was driven by the media interest. These, can help to understand the dynamics between the local news journalists and their audiences, and whether that can lead, for instance, to changes of agenda-settings (Russell et al., 2014).

Local media in the Spanish context

The financial pressure local news media is suffering is particularly dramatic in the case of Spain since, historically, the local press has played a central role in the country (Salaverria, Martínez-Costa and Breiner, 2018; Negreira-Rey et al., 2020). Notably, some of the most innovative projects in Spain were launched by local and hyperlocal media, probably in an attempt to counter the steady decline in the sector (García-Avilés et al., 2018). Spain is also an interesting country because possesses very active readers in social media, being the third top nation in sharing news stories via social network according to Newman and Levy (2014). The increase in consumption of social networks and local news was particularly significant in Spain during the pandemic: the consumption of social media increased by 55% (Pérez-Escoda et al., 2020) and the visits to local news websites in the first months of 2020 by 158% (Gevers, 2020). Further, Spain is amongst the European countries where the COVID-19 pandemic has produced the most severe economic consequences in the media industry. For instance, advertising investment dropped by 50% during April-May 2020 and temporary employment regulation files affected over 24,500 journalists by April 2020 according to the national employment office statistics (Garcia-Avilés, 2021).

The first COVID-19 case detected in Spain was on the 31st of January of 2020 when a German tourist tested positive for SARS-CoV-2 in La Gomera, Canary Islands. So, Spain was amongst the first in Europe to be hit by the pandemic, and on the 2nd of April, had, at the time, the largest number of deaths (950) by any country in the world in a single day. A nationwide lockdown was officially declared on March the 14th and lasted until June the 22nd. During this enforced state of emergency, the population was confined at their homes and citizens were allowed to leave home only in case there was a need to use essential services, such as supermarkets, pharmacies or hospitals. As of January of 2022, over 90% of its population has received their second dose of vaccine against

COVID-19, being one of the countries with the highest percentage of its population vaccinated. Nevertheless, the pandemic hit Spain harder than most countries, having, by January of 2022, almost 9 million people infected, the ninth largest number in the world (fourth in Europe), and over 90,000 people died from coronavirus (Centro Nacional de Epidemiología, 2021).

Spain is divided in 17 regions called autonomous communities. After the state of alarm ended on the 21st of June 2020, Spain entered into a "new normality" phase and each autonomous community became in charge of establishing local restrictions, imposing the necessary policies according the local pandemic situation.

Methodology and Data analysis

To investigate our research questions, we collected and analyzed a unique set of Facebook engagement data constituted by 237,482 articles. This was obtained through our partnership with Facebook via the application CrowdTangle, a social monitoring tool owned by Facebook that tracks public posts performance such as users' interactions and engagement with pages and links posted in Facebook.

From the 17 autonomous communities in Spain, we considered the most popular local news newspaper in each one of them in terms of the number of Facebook followers, see table 1. Within this group, we selected the 8 most popular ones out of the set of 17 local newspapers, following again the same criteria, that is, we selected the ones with more number of followers in Facebook, namely: *La Voz de Galicia* (962,642 followers), *Diario de Mallorca* (206,064 followers), *Heraldo de Aragón* (223,271 followers), *Diario HOY de Extremadura* (228,351 followers), *La nueva España digital* (313,858 followers), *La Provincia* (211,192 followers), *La Verdad de Murcia* (153,341 followers) and *Levante-EMV* (309,210 followers). The autonomous communities of Madrid and

Catalonia were not considered despite the larger number of followers, as the most relevant local newspapers focused largely on national news rather than mainly on local news. We collected all the articles of these local newspapers between the 1st of January of 2020 and the 31st of December of 2021. This resulted in a total of 237,482 shared posts related to any type of news, and we identified a subset of 43,338 news about COVID-19. In order to classify a COVID-19 related local news we used a dictionary-based analysis of the summary of the posts.

For each article, CrowdTangle was able to provide the total number of likes, comments, and shares. We shall refer to the sum of these metrics as Facebook interactions. The epidemiological data regarding Spanish COVID-19, including the daily number of infections (*i.e.* incidence) and of deaths, was downloaded from the official source of Centro Nacional de Epidemiología (Epidemiological National Center) (2021).

The easiest way to carry out some statistical tests to analyze our research questions, is to divide the study period in different phases based on the graphs and other epidemiological criteria and then compare the phases using different statistical tests.

Phases of the COVID-19 pandemic in Spain

To evaluate the evolution of the impact of the COVID-19 in local newspapers in Spain throughout the pandemic (years 2020 and 2021), five different phases (of the pandemic) were considered (Figure 1A & B). Phases were based strictly on common epidemiological criteria, that bases the divisions of the COVID-19 pandemic on the epidemic waves, but also considers epidemiological interventions such as lockdowns or vaccination.

- Phase 1: From week 1 (1st of January 2020) with the first news about the emergence of the COVID-19 in Wuhan (China) in the media until the end of week 9 (1st of March 2020) which marks the start of the first wave in Spain.

- Phase 2: From week 10 until week 20 (17th of May 2020) corresponding to the first wave of COVID-19 in Spain, characterized by moderate-high appearance of new cases (Figure 1A) and very high mortality (Figure 1B). This phase included most of the period of lockdown.
- Phase 3: From week 21 until week 61 (28th of February 2021) corresponding to the second and third waves of COVID-19, characterized by high appearance of new cases (Figure 1A) and high mortality (Figure 1B).
- Phase 4: From week 62 until week 98 (14th of November 2021) corresponding to the fourth and fifth waves of COVID-19, characterized by moderate appearance of new cases (Figure 1A) and low mortality (Figure 1B) as a result of high vaccination coverage.
- Phase 5: From week 99 until week 105 (31st of December 2021) corresponding to the sixth wave of COVID-19, characterized by an extremely high appearance of new cases (Figure 1A) and low mortality. This phase includes the emergence of the omicron variant.

Figure 1: Evolution of the number of new cases (A) and deaths (B) due to COVID-19 throughout the 2020/2021 pandemic in Spain. Mortality data was only available until week 94.

Measures of the impact of COVID-19

To evaluate the impact of the COVID-19 in local newspapers, three different measures were considered:

- a) The proportion of news in local newspapers that were related to COVID-19. This is a measure of the interest of (local) journalists in COVID-19.
- b) The proportion of interactions in local newspapers that were related to COVID-19. Interactions are defined as the sum of all possible interactions with an article posted in Facebook which include number of shares, comments, “likes” and the six reactions on

top of the standard likes, namely, “Love”, “Care”, “Ha-ha”, “Wow”, “Sad” and “Angry”. The sum of Facebook interactions was used as a measure of the interest of the readers (of local newspapers) in COVID-19.

c) Furthermore, to assess possible differences in the interest in COVID-19 between the local journalists and the readers of local newspapers, another measure, impact difference, estimated as a) minus b), was also calculated.

Statistical Analyses

To evaluate RQ1, we tested whether there were statistically significant differences in the percentage of local news articles about COVID-19 shared in Facebook among the different phases of the 2020-2021 COVID-19 pandemic in Spain. To evaluate RQ2, we tested whether there were statistically significant differences in the percentage of Facebook interactions about COVID-19 related news among the different phases of the 2020-2021 COVID-19 pandemic in Spain.

Therefore, for both RQ1 & RQ2, first, the normality of the data (*i.e.* proportion of news and interactions in local newspapers related to COVID-19) by each group (phase) was tested by means of the Shapiro-Wilk test. If data was normally distributed, the ANOVA test, plus the *post-hoc* Tukey test (for pairwise comparisons) were used. If data was not normally distributed, then the Kruskal-Wallis test, plus the *post-hoc* Dunn’s test (for pairwise comparisons) were used.

For RQ3, to compare the proportion of news and interactions in local newspapers related to COVID-19 through the whole pandemic, first, the normality of the data was tested by means of the Shapiro-Wilk test. If data was normally distributed, a t-test to compare mean proportions was used. If data was not normally distributed, then a Wilcoxon rank sum test (*i.e.* Mann–Whitney U test) was used. To test whether a) the local

media interest in COVID-19 was driven by the interest of readers or b) the interest of readers was driven by the media interest, we evaluated the lagged correlations (minus one day, minus two days, up to seven days) between these two parameters. Given the non-parametric nature of the data, we used the Spearman rank correlation test. Correlation was evaluated for the whole period of study but also independently for the different phases of the pandemic.

Results

1-Local media coverage of news about COVID-19

Descriptive results

In Spain, the interest of local journals in COVID-19, measured as the proportion of news in local newspapers related to COVID-19, was high with an average value of 19.5% of the total news for the period 2020-2021. That interest, however, was not constant but shifted throughout the pandemic. The first phase evidenced an increased interest in COVID-19 which went from 0% of news in early January to almost 20% by week 940 (Figure 2A) as a result of the first cases of autochthonous transmission in Spain and the first deaths attributed to COVID-19. The second phase started with a steep increase in COVID-19 which reached a peak by week 13 with almost half of the news in local newspapers about COVID-19, which coincided with the period of lockdown and the maximum number of deaths due to coronavirus (Figure 1B). Then, interest progressively decreased to less than 30% by the end of phase 2. In phase 3, the interest in local journals was maintained between 20 and 30% of the news despite significant changes in the number of cases and deaths throughout the period (Figure 1A & B). In phase 4, there was a slow decrease of local media interest, which went from about 20% of the news to about 10% (Figure 2A). Phase 5 showed a certain change of tendency, as the proportion of local

news related to COVID-19 rapidly increased from about 10% to more than 20% (Figure 2A) whereas the number of deaths remained low and the number of positives almost doubled the previous maximum.

Figure 2: Evolution of the proportion of news in local newspapers (A) and proportion of interactions in local newspapers (B) related to COVID-19 throughout the 2020/2021 pandemic in Spain.

Statistical analyses

The proportion of news in local newspapers related to COVID-19 changed in the different phases of the pandemic: 4.1% (95%CI: 2.8-5.5) in phase 1, 37.3% (95%CI: 34.9-39.7) in phase 2, 23.2% (95%CI: 22.7-23.6) in phase 3, 14.4% (95%CI: 13.7-15.0) in phase 4, and 15.5% (95%CI: 14.4-16.7) in phase 5 (Figure 3A). The statistical analyses show that differences between phases were statistically significant, as shown by the results of the Kruskal-Wallis test (p -value $< 2.2 \cdot 10^{-16}$). Pairwise comparisons were also statistically significant in all cases except between phases 4 and 5, as shown by the results of the Dunn's test (p -values between $8.7 \cdot 10^{-6}$ and $2.0 \cdot 10^{-16}$).

Figure 3: Boxplots for A) proportion of news in local newspapers related to COVID-19, and B) proportion of interactions in local newspapers related to COVID-19 in the different phases of the pandemic. The numbers represent mean proportions for each phase, in brackets 95% CI.

II- Public interaction of local news about COVID-19 in Facebook

Descriptive results

In Spain, the interest in COVID-19 of the readers of local newspapers, measured as the proportion of the interactions in local newspapers that were related to COVID-19, was very high with an average value of 23.4% of the total news for the period 2020-2021. That interest, however, was not constant but changed throughout the pandemic. In the first phase, readers' interest in COVID-19 increased rapidly from 0% in the beginning of January to almost 20% by week 9 (Figure 2B). Phase 2 started with a very steep increase of the interest, which reached a maximum of 53.9% by week 12, and then promptly decreased to just above 30% by the end of phase 2. Phase 3 was characterized by constant increases and decreases of the readers' interest although the proportion of COVID-19 interactions is maintained between 20 and 35% throughout the whole period (Figure 2B). In phase 4, the pattern showed a slow decrease in the interest of readers, which changed with the start of phase 5, after which the interest quickly increased up to values of almost 40% by the end of 2021.

Statistical analyses

The proportion of Facebook interactions in local newspapers related to COVID-19 changed in the different phases of the pandemic: 4.8% (95%CI: 3.2-6.4) in phase 1, 41.7% (95%CI: 39.0-44.4) in phase 2, 29.4% (95%CI: 28.8-30.1) in phase 3, 15.1% (95%CI: 14.2-16.1) in phase 4, and 24.3% (95%CI: 21.8-26.9) in phase 5 (Figure 3B).

The statistical analyses showed that differences between phases were statistically significant, as shown by the results of the Kruskal-Wallis test (p -value $< 2.2 \cdot 10^{-16}$). Pairwise comparisons were also statistically significant in all cases, including between phases 4 and 5, as shown by the results of the Dunn's test (p -values between 0.01 and $2.0 \cdot 10^{-16}$).

III- Difference in interest between local newspapers and their readers

Descriptive results

In general, the interest of local newspapers and their readers in Spain followed a similar pattern through the different phases of the pandemic. Although, the curves have shown a parallel pattern, the public interaction was slightly higher than the interest of the local media by just a 3.8% difference on average. Despite that similarity, some specific moments in which the interest of the local newspapers and readers diverged were identified. The larger gap was observed in the last wave due to omicron, achieving almost 30% at the last days of this study (end of December 2021). Also, our data indicates that the gap increased steepest during the periods between the weeks 7-10, 41-44, 51-53, 77-80 and 97-105 which correspond to the beginning of the first, second, third, fifth and sixth waves.

Statistical analyses

Another interesting result was that while the patterns of interests were similar, the overall interest of readers was higher than the interest of local newspapers, as shown by the results of comparing the proportions of news and interactions for the whole pandemic by means of the Wilcoxon rank sum test ($p\text{-value} < 7.2 \cdot 10^{-12}$). The evaluation of the correlations between the local media interest in COVID-19 and the interest of their readers failed to identify any lagged effect, not even when the epidemic phases were assessed independently. Therefore, the highest values of the Spearman correlation coefficient (ρ) were found between the local media interest and the interest of the readers in the same day.

Figure 4: Evolution of the impact difference (proportion of news in local newspapers minus proportion of interactions in local newspapers) by week.

Discussion and conclusions

In this paper we analyzed the dynamics of the local news coverage devoted to the coronavirus pandemic in Spain during 2020 and 2021, as well as the social media interactivity corresponding to that news. We also assessed the correlation between these two measures to understand whether COVID-19 news was properly covered by local media with respect to the public interest.

Our findings show that the interest of both local journalists and readers in COVID-19 news was high throughout the whole period of study. This suggests that local journalists consistently covered the COVID-19 crisis, and that readers kept interest in the subject throughout 2020 and 2021. When consumers are exposed to a large volume of news on the same topic that is constantly updating, it is expected that they develop negative feelings regarding the issue (i.e. news fatigue), and their motivation to engage with it is expected to decrease (Gurr, 2022). In fact, news fatigue in relation to COVID-19 has been observed in the US, as according to a Pew Research Center survey, by April 2020, as the pandemic intensified, so did the fatigue of the users (Michell et al., 2020). This survey concluded that 71% of Americans had difficulty to stay focused on COVID-19 news and needed to take breaks from this news. While a fatigue with COVID-19 related news would have been expected in Spain after more than two years since the start of the pandemic, even at the end of the period of study, an important proportion of news and interactions were related to COVID-19.

Interestingly, as the pandemic progressed, the proportion of news, and to a lesser extent the proportion of interactions, seemed to be less affected by the evolution of the disease (e.g. changes in incidence). The consistent high interest of the Spanish readers throughout the pandemic, expressed via Facebook interactions, highlights the importance of social media during a severe crisis such as the one caused by the COVID-19. What

local news media shared on Facebook met audience interest and helped to disseminate critical local information.

Both the interest of local journalists and readers in COVID-19 changed throughout the COVID-19 in Spain. With the exception of the fifth phase, the number of deaths (rather than the number of cases) was a strong predictor of coronavirus coverage and public engagement. In the fifth phase, interest in local media and their readers increased despite relatively low mortality, and that interest was probably linked to the uncertainty about the consequences of the Omicron variant.

Our third research question was to delve into the gap between what the public is interested in and what local media actually publishes, during the coronavirus pandemic in Spain in 2020 and 2021. While in general these two measures followed a similar pattern, the overall interest was on average lower for local journalists than for their readers. The public interaction was slightly higher than the interest of the local media by just a 3.8% difference on average. The fact that the overall interest of the public was higher than the interest of local media, is somehow surprising from the media perspective point of view, since researchers have consistently documented that soft news generally generate more interest than hard news such as the ones about COVID-19 (Hamilton, 2004; Boczkowski and Mitchelstein 2017; Boydston, 2013; Thompson, 2014). It has been extensively argued by researchers that such a divergence between journalists and consumers' preferences (the gap coverage) has produced a trend toward the softening of news that can be regarded as an effort by journalists to counter their market decline and narrow the gap between what they produce and their consumers' interests.

However, as mentioned above, in this work we have observed that the Spanish public showed a relatively high interest in COVID-19 news (hard news) with respect to other news. But this might not be that surprising in light of some recent research. For

instance, in Masullo, Jennings and Stroud (2021) the notion of *crisis coverage gap* was introduced and it was argued that during a period of cataclysm, such as the one generated by COVID-19, the news is crucial and in turn the discrepancy between public's interest and the media's coverage are likely to function differently during intensive periods. In fact, they showed (Masullo, Jennings and Stroud, 2021) that coronavirus related local news in U.S. received high public engagement but were over-covered by the local media. This is a bit different than our findings as our data indicates also high public engagement but a slightly lower-coverage by the media, on average. This may be due to the different idiosyncrasy between the U.S. and Spain, with U.S. being one of the developed countries with lowest vaccination rate and Spain one with the highest. This much higher reluctance to get vaccinated in U.S. than in Spain, can be less like COVID-19 vaccine hesitancy and more like COVID-19 denialism, and if so, then overcoming it may prove much harder (Uscinski et al., 2020).

It is important to note that despite the fact that the gap between what the audiences are interested in and what local news media provides, remained relatively constant, we did find some fluctuations over the pandemic. Notably, we detected that the gap increased steepest during the periods between the weeks 7-10, 41-44, 51-53, 77-80 and 97-105 which correspond to the beginning of the first, second, third, fifth and sixth waves. Note that the fourth wave was, by far, the mildest wave and never reached the 300 cases per day (14-day notification rate of newly reported COVID-19 cases per 100,000 population) nor 100 deaths per day. This suggests that during these phases the media was lagging behind the public interest failing to respond to the increasing number of cases and customer's engagement. It is of particular interest the huge divergence in the omicron wave, reaching almost 30% at the end of December 2021, the largest disparity of the

pandemic. This may indicate a possible coverage fatigue from the media with respect to the public and, in turn, local citizens did not receive sufficient COVID-19 news coverage.

The assessment of whether the local media interest in COVID-19 was driven by the interest that local media readers had in COVID-19, or the opposite, failed to identify any lagged effect between these two parameters. Lack of effect does not necessarily mean that any of these parameters is not influenced by the other, as we are using days as units, and the reactions of one to the other may occur within the same day. Further studies with a smaller timeframe (e.g. hours) would be needed to better evaluate the relationship between local media interest in COVID-19 and the interest of their readers.

While we have tried to guarantee that our analysis and data are robust, our study has limitations that should be acknowledged. First, we situated this study in Spain since it is one of the countries in the eurozone most severely affected by COVID-19, but we note that our findings cannot be straightforward generalized to other countries. This work therefore complements similar studies in other countries (Masullo Jennings and Stroud, 2021; Joseph et al., 2021). Another possible limitation is that, although our sample is large and covers a broad geographic area in Spain, not all regions were covered. For example, important autonomous communities such as Madrid and Catalunya were not considered as the most relevant local newspapers focused largely on national news rather than mainly on local news. Hence, we employed a specific definition of local media that relies on the subjective idea of what is local.

Despite these limitations, our study contributes to the digital journalism literature regarding how local media and audiences have covered the COVID-19 pandemic in Spain amid decades of persistent economic challenge. An issue of interest for future research is the comparison between the COVID-19 coverages of local and national media, and to investigate the differences between local COVID-19 news produced by traditional local

media versus online-native media, and between local organizations owned by chains versus independently owned ones. Finally, it would also be interesting to complete the research after the sixth wave due to Omicron variant and also continue this line of research focusing on other types of crises, such as natural disasters or economic collapses.

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FIGURES

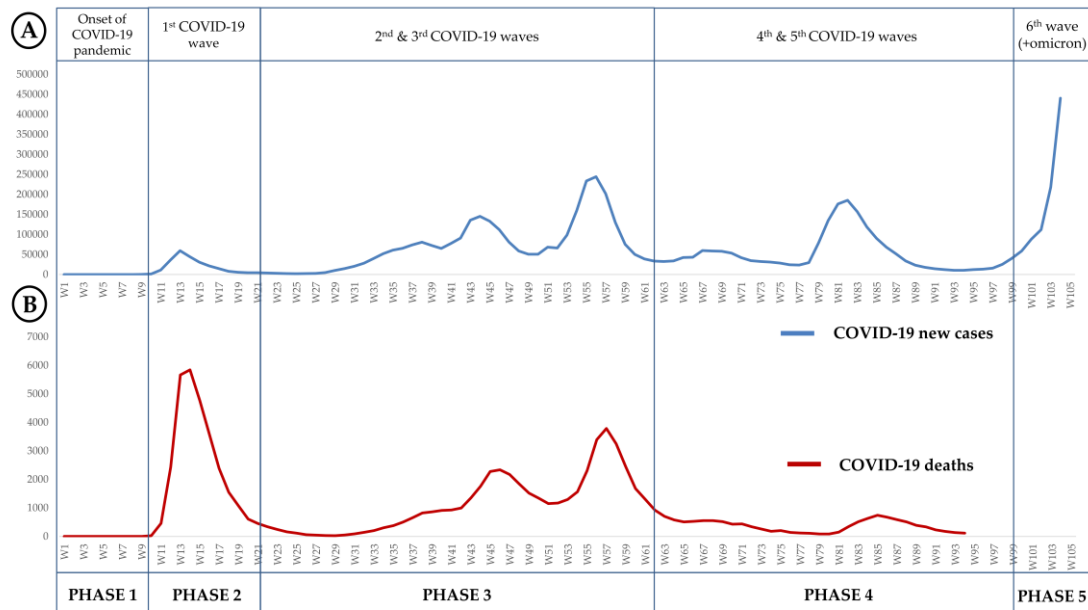


Figure 1. Evolution of the number of new cases (a) and deaths (b) due to COVID-19 throughout the 2020/2021 pandemic in Spain. Mortality data was only available until week 94.

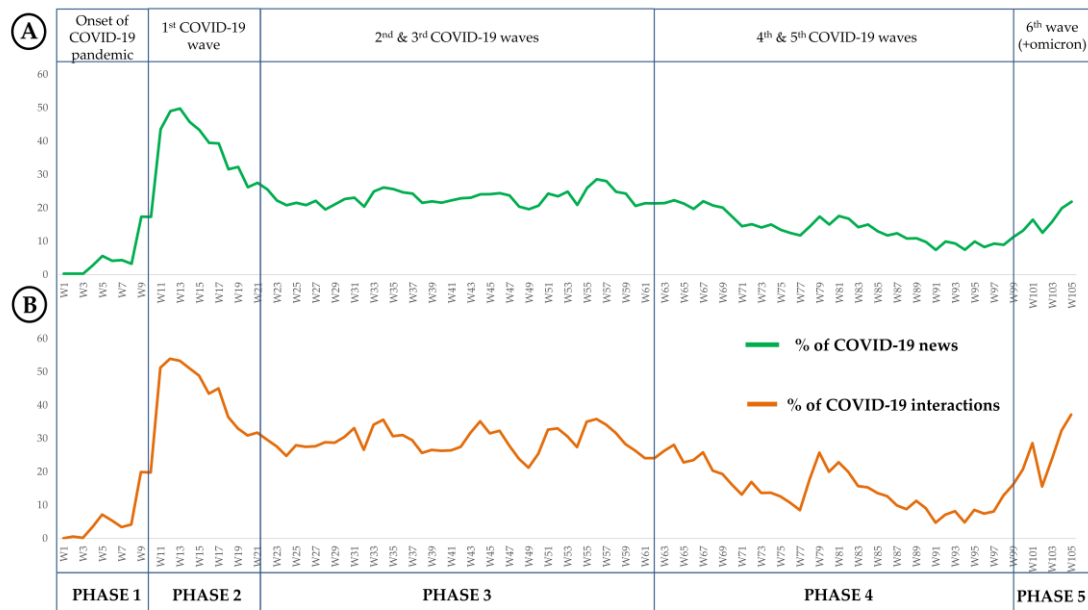


Figure 2. Evolution of the proportion of news in local newspapers (a) and proportion of interactions in local newspapers (b) related to COVID-19 throughout the 2020/2021 pandemic in Spain.

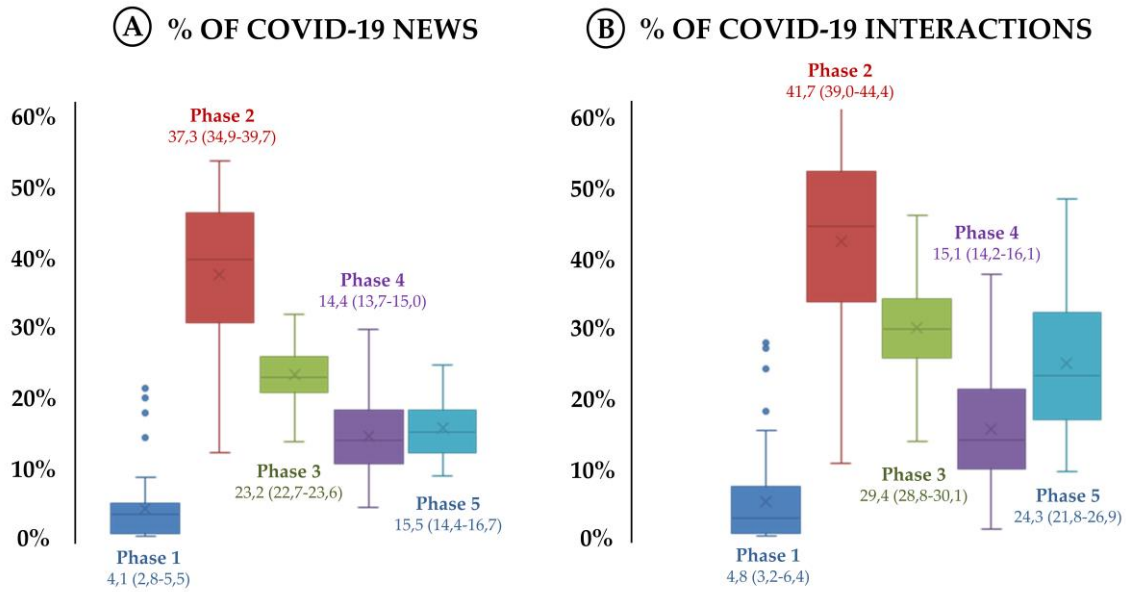


Figure 3. Boxplots for (a) proportion of news in local newspapers related to COVID-19, and (b) proportion of interactions in local newspapers related to COVID-19 in the different phases of the pandemic. The numbers represent mean proportions for each phase, in brackets 95% CI.

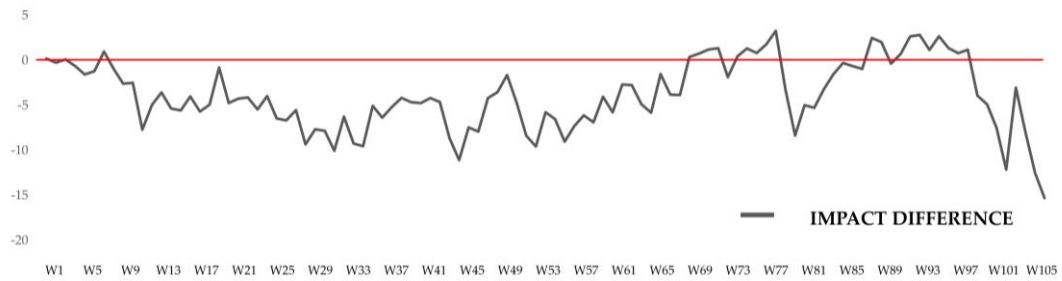


Figure 4. Evolution of the impact difference (proportion of news in local newspapers minus proportion of interactions in local newspapers) by week.