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Fact-checking in Europe: data journalism as the spearhead in the fight against COVID-19 misinformation

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ABSTRACT
Introduction: This research analyses the content strategy of fact-checkers from five Western European countries and, within it, the way they used data journalism to fight against misinformation about COVID-19. **Methodology:** From a sample of 2,410 publications by 25 European fact-checkers, a content analysis is conducted to define the type of content published, the use or non-use of data journalism techniques, the level of development of these techniques and the inclusion of transparency elements. **Results and discussion:** Fact-checkers base their content strategy on a dual approach: the publication of fact-checks complemented by contextual content. Data journalism techniques appear in 35.9% of the total, with this percentage exceeding 40% in 12 of the 25 media outlets in the sample. The use of visualizations reaches 39.5% of the publications with data journalism, a percentage that exceeds 40% in 11 of the 25 outlets in the sample. **Conclusions:** The study proposes a categorization of fact-checkers based on their relationship with data journalism: data-specialized media conducting verifications, fact-checkers who predominantly and advancedly use data journalism, fact-checkers who employ data in a basic way in their verifications,

and media outlets that use data journalism only superficially. The study emphasizes the need for improvements in transparency, particularly methodological, to foster greater public trust and progress in media literacy.

Keywords: digital journalism; big data; data journalism; datafication; fact-checking; verification; coronavirus; pandemic; COVID-19.

1. INTRODUCTION

Data-driven journalistic specialization, which journalistic organizations have incorporated as a specialty that introduces innovations in journalism (Flores-Vivar & Salinas-Aguilar, 2013), has meant an evolution in the incorporation of renewed techniques and tools in journalistic production. This journalistic modality, which emerges in a context of big data and computer applications using high technology, has shown its strengths when telling stories based on large amounts of information and treated by means of computational systems, the application of statistical methods (Albert-Trinidad, 2020) and, for some time now, Artificial Intelligence techniques. Accuracy journalism (Meyer, 1991) and CAR (computer-assisted reporting) (Gray et al., 2012) have inherited techniques that ensure the depth achieved through the application of scientific methods of social research which now, with renewed technological tools and scientific methodology, opens up new possibilities for professional digital journalism.

Since its beginnings, the journalistic pieces provided by journalists who have bet on this specialty, several of which have been recognized with Pulitzer prizes, have been relevant and impacting, which has encouraged the views of scientific researchers. Journalistic practice through new methods and genres in legacy media, as an evolution of journalistic research and precision journalism towards new data and computational dimensions, has evidenced the need for better training to acquire new skills (Appelgren & Nygren, 2014.) as well as, the potential of this data journalism as a professional response to the datification of society (Loosen et al., 2020), as it consolidated and its work became more complete. Data storytelling thus came of age as a characteristic activity of digital journalism through specialization in certain types of stories, with state-of-the-art tools and through practice by journalists who have acquired enabling competencies (Ojo & Heravi, 2018).

Today's data journalism, which is based on four discourses - journalism, technology, business and citizenship (Hannaford, 2023) - is defining its contributions as it conquers new spaces. The advent of artificial intelligence has proved decisive for the new wave of data journalism. Artificial Intelligence and Big Data, those two technologies that combined multiply its effectiveness, feed the current data journalism that, beyond technological determinism, has become an important element to guide the current and future course of the journalistic profession (de-Lima-Santos & Mesquita, 2021). The number of professionals trained for its practice increases and the number of pieces being disseminated also maintains a steady rise in this post COVID-19 pandemic stage, in which data journalists seem to enter with a better reputation thanks to the work done in recent years (Bisiani et al., 2023). The third decade of the ongoing millennium seems to be a favorable stage for data journalism to continue to advance.

1.1. Data and its verification in difficult times

The consolidation and progress of data journalism in a pandemic context such as the one experienced by the effects of COVID-19 have been a strength for journalism and for this journalistic specialty that has been able to take advantage of the existing common ground with fact-checking. These commonalities, which are mainly the renewal of the notion of objectivity, transparency, the empowerment of audiences, restoring citizens' trust in the media and working in multidisciplinary teams (Casás, 2023), have made it possible to add value to the techniques used, join forces and offer more complete and better-informed journalistic pieces. Data journalists have faced the challenges posed in a difficult scenario with positive results.

COVID-19 triggered a massive demand for data-driven reports to make sense of the pandemic (Bisiani et al., 2023) and to try to provide reliable data that would nurture public confidence in the actions being taken and influence behavior (Loxton et al., 2020). The coronavirus crisis has generated a complicated situation at the health, economic and social levels, which has required a fundamental communication effort for society to understand and collaborate with the measures adopted (Costa-Sánchez & López-García, 2020). In this complex context, the media, which once again have shown that they play a crucial role during health crises (Román-Etxebarrieta et al., 2020), and, in general, in global crisis scenarios characterized by "risk situations", have resorted with some frequency to pieces based on the "objectivity" of data to help shape public opinion in times of crisis (Kim, 2022). In fact, during the pandemic there was a resurgence of the role of traditional media, especially television, and a reconnection of citizens with the news (Casero-Ripollés, 2020). However, after overcoming the health crisis, the latest major reports, such as the Digital News Report, point to a significant decline in the consumption of news, with segments of the population (about 40% in 2024) consciously avoiding news, a phenomenon called "news avoidance": users are overwhelmed by news, either because of the topics - Ukrainian war, disasters, politics - or because of the volume (Newman et al., 2022; 2023; 2024).

This strategy focused on the good use of data has been important as the pandemic, as an unpredictable media event and in a context of potential division and polarization (Mihelj et al., 2021), has occurred in societies characterized by "hybrid" media consumption, with citizens turning to all existing media and seeking pieces in both legacy and digital native media and social networks (Vaccari et al., 2015). Public health scholars and practitioners have similarly recognized that the global health crisis caused by COVID-19 has highlighted the additional possibilities that data journalism can offer (Desai et al., 2021).

The good results and recognition of the contributions of data journalism, increasingly relevant for a higher quality and more transparent journalism (Córdoba-Cabús et al., 2023), have been largely due to alliances and the relationships with fact-checking processes, which have allowed it to include new dimensions and offer more added value in the pieces that follow these techniques. First, by building rules and processes capable of overcoming the notion of "procedural objectivity" (Lawrence, Schafer; 2011), typical of declarative journalism A says / B says, not very useful insofar as it establishes objectivity in the balance of giving voice to two opposing points of view. Verification and data journalism make use of a positivist tradition model of science (Coddington et al., 2014; Lawrence & Schafer, 2011; Meyer, 1991), conveyed through methodological accuracy and transparency and which focuses on the objectivity of facts and data.

Thus, the traceability of the process is a fundamental axis in operations -the use of a visualization (Bradshaw, 2011a) should give the user the possibility of following the same path taken by the journalists who have produced it- and in the legitimization of both disciplines. It is not for nothing that most of the active fact-checkers are part of the International Fact-Checking Network (IFCN), a membership that requires them to comply with a series of standards in terms of methodological transparency, transparency of sources and commitment to the review and correction of errors. The IFCN is perhaps the most important, but not the only association of this nature: the European Fact-Checking Standards Network (EFCSN) has 48 associated verifiers across the European continent. The zeal for transparency is also evident in data journalism, as a practice, in methodology, access to data and creation of tools such as Transparentia (transparentia.newtral.es, n.d.), and as a demand to institutions: advocacy for the development of legislation on transparency and Open Government (Dader, 1998; 1999; 2001).

To strengthen the first two common elements, it is essential to actively participate and empower the audiences or communities of the media in these specialties, by different means: crowdsourcing has been one of the most recurrent (Rodríguez-Pinto et al., 2019; Ghenai & Mejova, 2017; Bradshaw, 2011a.). Many fact-checkers start from community notices, or gamification, a route that puts into practice through the use of visualizations or interactive applications, i.e., the customization and utilization phases of the data journalism

pyramid (Bradshaw, 2011b). These lines of action are complemented by the discourse layer, focused on rebuilding the media-audience trust link and which, as described above, was vital in the infodemic resulting from the COVID-19 crisis.

The last connecting element is technology. The first and most evident characteristic of these media is their origin and majority trajectory in the digital environment (Ufarte-Ruiz, et al. 2022), since most of the representatives of both modalities, Factcheck.org, Politifact, Les Décodeurs, The Fact Checker, Civio are important references, have as their main support their website. Secondly, the methodological bases and the quality and transparency standards of data journalism and fact-checking require the involvement of multidisciplinary teams in which digital skills play a leading role (López-García et al. 2016; Grassller, 2017; Vizoso et al., 2018; Cazalens et al., 2018): advanced search engine management, advanced skills in databases and spreadsheets, data mining, data scraping, programming, web design and development or digital infographics are the main ones.

In the context of health crisis, projects such as #CoronavirusFacts Alliance, a multilingual database with analyzed and verified COVID-19-related misinformation, and involving more than 100 fact-checkers from around the world (Brookes & Waller, 2022), are a clear example of the link between both disciplines. Beyond specific use cases, there is a clear need to broaden and deepen the knowledge of how data journalism develops in the fact-checking ecosystem and how it conditions it in terms of content production, approaches, routines and transparency, to the point of being able to determine whether data journalism is circumstantial or whether it operates as a transversal axis of action and evolution of fact-checkers, focusing on the greater or lesser contribution that data journalism can make to the recovery of media/citizenship trust. The European context, with a wide and varied fact-checking ecosystem - 141 active projects out of the 446 existing globally, according to the Duke Reporter's Lab database - is an ideal scenario on which to carry out this analysis.

2. OBJECTIVES

This paper aims to analyze the level of development of data journalism carried out by 25 European fact-checkers from five countries: Spain, France, UK, Italy and Germany during the COVID-19 crisis, specifically during the year 2021, having as main axes of analysis the degree of practical involvement of the different stages of Bradshaw's pyramid. In this case, the presence of visualizations is identified with a stage of advanced data journalism, and the attention to the elements of transparency, the data journalism as a reinforcement of the code of principles of fact-checking. The research questions are as follows:

> RQ 1. Is there a broad use of data journalism by the fact-checkers included in the sample to fight against disinformation?
>
> RQ 2. What is the COVID-19 content strategy of the sampled media and what role does data journalism play in it: do they only publish fact-checks or do they complement fact-checks with other types of content?
>
> RQ 3. How well do the sampled fact-checkers adopt and apply data journalism techniques in relation to the fight against misinformation about COVID-19?

3. METHODOLOGY

The methodology used for the development of this research is deductive (Potter & Levine-Donnerstein, 1999; Fife & Gossner, 2024) based on the requirement of using theory to elaborate the manifest content data coding scheme. From the theoretical approach addressed in the theoretical framework (Graves, 2016; Bradshaw, 2011a; Bradshaw, 2011b; Córdoba-Cabús & García-Borrego, 2021), the definition of the research

questions is reached because, as the authors indicate, this theory-based definition will constitute the basis for the validation of the subsequent research arguments.

The validation of the selected method rests on the "experienced mode" strategy of Poole and Folger (1981), according to which researchers analyze the interaction of parameters as external observers with direct access to the most relevant variables in terms of interaction. The first step of validity consisted of formulating a coding scheme, while the second focused on contrasting it with the theoretical standards indicated in the theoretical framework.

Thus, a qualitative content analysis was conducted, based on previous works such as those of de-Lima-Santos (2023) and Morini (2023), which focused on the presence or non-presence of data journalism techniques in the different information products published by these verifiers, verifications or contextual content, and, if present, their performance in terms of development: use of visualizations, how visualizations are produced, their typology, recurrent sources and transparency standards (methodological and source).

The research is based on an analysis sheet with a coding scheme that includes six variables, the relevance of which was evaluated by means of a pre-test to ensure validity:

1. Type of content. A distinction is made between two main types of content: fact-checking and contextual content. The former are those publications that are made under the standard format of fact-checking (Graves, 2016): identification of a potential misinformative content and exposition of the verdict, whether or not a scale of truthfulness is provided, and the relevant explanations of how the verdict has been reached. Contextual content is all content that cannot be classified as verification and that conforms, in the vast majority of cases, to the classic journalistic genres, mainly journalistic reports and news. This classification is applied in the file with an item called Subtype of content.

2. Use of data journalism techniques. Bradshaw's pyramid (2011a) is used as a reference, which defines the six phases through which information is made with data: compilation, cleaning, contextualization, combination and communication. The positive answer depends on identifying at least two of these phases: compilation, when a database appears as a source to build the information, and communication, when the data are communicated textually (narrative), with visualizations or in combination. The answer is coded as a Yes (positive) or as a No (negative).

3. Development of data journalism. Take into account the presence of the phases of Bradshaw's (2011b) second pyramid, that of Communication:

> - Visualization: any type of graph (timeline, bar graph, maps, etc.) appears on the piece of information, either in image or interactive format. Either Yes (positive answer) or No (negative answer) can be checked.
>
> - Visualization: any type of graph (timeline, bar graph, maps, etc.) appears on the piece of information, either in image or interactive format. Either Yes (positive answer) or No (negative answer) can be checked.
>
> - Narration: Data is explained textually or the composition of the visualizations leads the user through a narrative. Either Yes (positive answer) or No (negative answer) can be checked.
>
> - Social communication: The visualization includes elements that allow its redissemination (sharing buttons or embedding in other web pages) or it is a static image that can be shared. Either Yes (positive answer) or No (negative answer) can be checked.

- Humanization: appearance of people in the visualizations or quotation of specific people. Either Yes (positive answer) or No (negative answer) can be checked.

- Customization: visualizations add filtering elements or game dynamics that allow the user to generate his/her own experience through the consumption of the visualization. Either Yes (positive answer) or No (negative answer) can be checked.

- Use. The visualization includes elements of interaction. Either Yes (positive answer) or No (negative answer) can be checked.

The presence of visualizations and the inclusion of the different phases offers relevant information on how narratives are constructed with data in these media.

4. Visualization production. It deals with the way in which the visualization has been generated. The classification is as follows:

   - Specialized software (Flourish, Datawrapper or others). The visualizations included in the information have been produced thanks to specific software for this purpose.

   - Self-produced (interactive). Visualizations generated with proprietary programming, which are interactive and do not require the use of any third-party software.

   - Self-produced (image or video). Visualizations generated with proprietary programming and that do not refer to the use of any third-party software. In this case, they are added to the piece of information as an image or exhibited within an audiovisual piece.

   - Insertion of third parties. The visualization is inserted through code or as an image within the piece of information.

5. Type of visualization. The greater or lesser variety of visualizations or their complexity allows conclusions to be drawn about the data journalism capacity of these media.

6. Transparency. Based on the contributions of Córdoba-Cabús and García-Borrego (2021), four parameters are defined:

   - Explanation and access to methodology: the content offers a space in which explanations are given on the data journalism methodology being implemented. A Yes (positive answer) or No (negative answer) is marked.

   - Explanation and access to sources: the content provides hyperlinks to the sources used to produce the information. Check Yes (positive answer) or No (negative answer).

   - Access to raw data: the content places hyperlinks to the original databases from which the information was obtained. Check Yes (positive answer) or No (negative answer).

   - Access to processed data: the content places hyperlinks to the databases produced by the media itself. Yes (positive answer) or No (negative answer).

The sample is based on 2,410 publications published in 2021 on the websites of 25 European fact-checkers in the desktop web version. Following the good practices pointed out by Lacy et al. (2015), and in order to ensure the validity of the selected sample, the choice was made to go to the Duke's Reporters Lab's renowned database of global data fact-checkers. The focus was then placed on five European countries:

Spain, France, the United Kingdom, Italy and Germany. This selection was justified on the basis of the following arguments:

- These are five of the most important countries in Western Europe and the European Union (except for the United Kingdom). All of them are established democracies with long-established, broad and diverse media ecosystems. The sample is representative of Hallin and Mancini's (2008) three media systems: polarized pluralistic model (Spain, Italy and France), democratic corporatist model (Germany) and liberal model (United Kingdom).

- As a result of the previous reason, these media ecosystems are home to legacy media, including big international names such as BBC, Le Monde or Reuters, and digital native projects that have gained space and social relevance in recent years.

- Most of the fact-checkers in these countries are signatories of the IFCN code of principles and lead, in collaboration with large supranational entities such as the European Union, media literacy projects and the fight against disinformation.

- The sample is balanced in the presence of verifiers linked to long-established media (legacy media) with new independent initiatives (digital natives).

The final selection of five fact-checkers per country was based on two criteria: Sistrix Visibility Index, a criterion for measuring visibility in search engines, and having published sufficient content (at least 50 publications on coronavirus). The Sistrix Visibility Index is a leading criterion for evaluating the relevance of websites because it measures their presence in the organic search results of Google, the world's leading search engine. This indicator shows the potential traffic and the quality of positioning, key factors to identify pages with real impact (Codina, 2020). Thus, within each country, the five media with the highest Visibility Index were selected: the higher the Visibility Index, the greater the capacity to reach more people. In addition, the fact-checker's link with the International Fact-checking Network (IFCN) was also considered to be relevant. The year 2021 is delimited as the period of analysis, as it is a full year under the global alert for COVID-19 and because it takes place in one of the most important milestones of the pandemic: vaccination. The analyzed content was extracted in two ways. The first: using the Sistrix tool explorer, taking from each website 100 random URLs including the keywords “coronavirus”, “COVID”, “pandemic” or “vaccine” (with their respective translations in each country) and discarding those not published in 2021. The second: manual selection. The following table shows the final results:

Tabla 1. *List the fact-checkers included in the sample.*

Country	Media	Sistrix Visibility Index	Number of publications	IFCN Member
Spain	*Maldita*	5.232	100	Yes
	Newtral	8.284	100	Yes
	AFP Factual	0.245	100	Yes
	EFE Verifica	0.1341	100	Yes
	Verificat	0.04	100	Yes
France	*Les Décodeurs*	115.3	100	Yes
	CheckNews	35.51	100	Yes
	20 Minutes Fake Off	160.64	100	Yes
	Les Vérificateurs	46.69	100	Yes
	Vrai ou Fake. France TV	114.89	100	Yes
United Kingdom	*BBC Reality Check*	220.92	100	No

	Reuters Fact Check	18.4	100	Yes
	Channel 4 FactCheck	15.72	63	No
	Fullfact	0.5042	100	Yes
	Logically	0.0266	100	Yes
Italy	*Open*	21.77	100	Yes
	Pagella Politica	1.348	100	Yes
	Bufale	0.6335	100	No
	Facta	0.6746	100	Yes
	La Voce	3.638	93	Yes
Germany	*ZDFheuteCheck*	0.0196	54	No
	BR24 #Faktenfuchs	0.0018	100	Yes
	CORRECTIV	1.227	100	Yes
	AFP Faktencheck	0.0833	100	Yes
	dpa-Faktencheck	0.3309	100	Yes

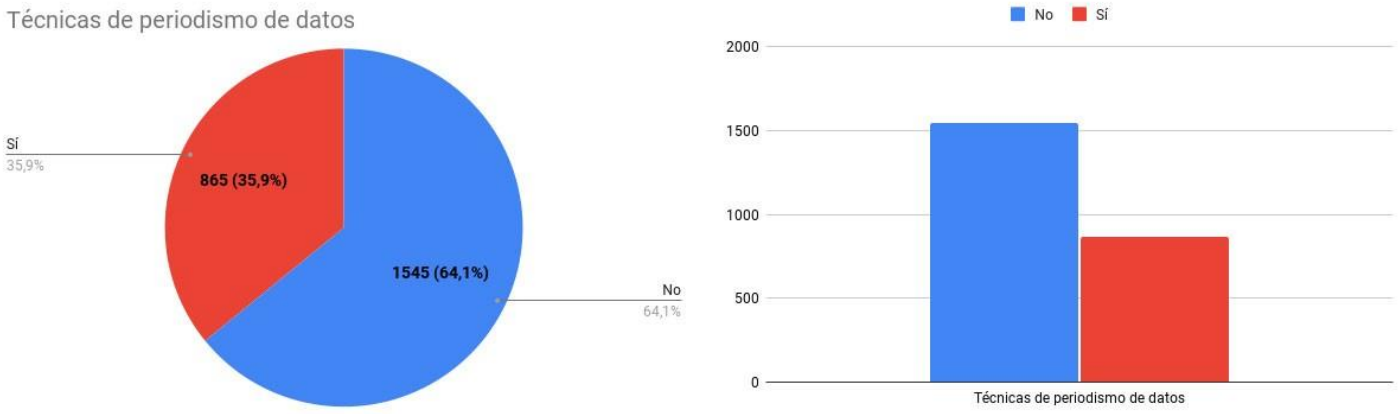
Source: Elaborated by the authors.

4. RESULTS

4.1. Is there a wide use of data journalism by the fact-checkers in the sample in the fight against disinformation?

The results of the content analysis confirm a non-majority but relevant presence of data journalism techniques in the publications made by the fact-checkers analyzed: 35.9% of the sample. Data journalism appears in 865 of the 2,410 news pieces analyzed, as shown in the following figure.

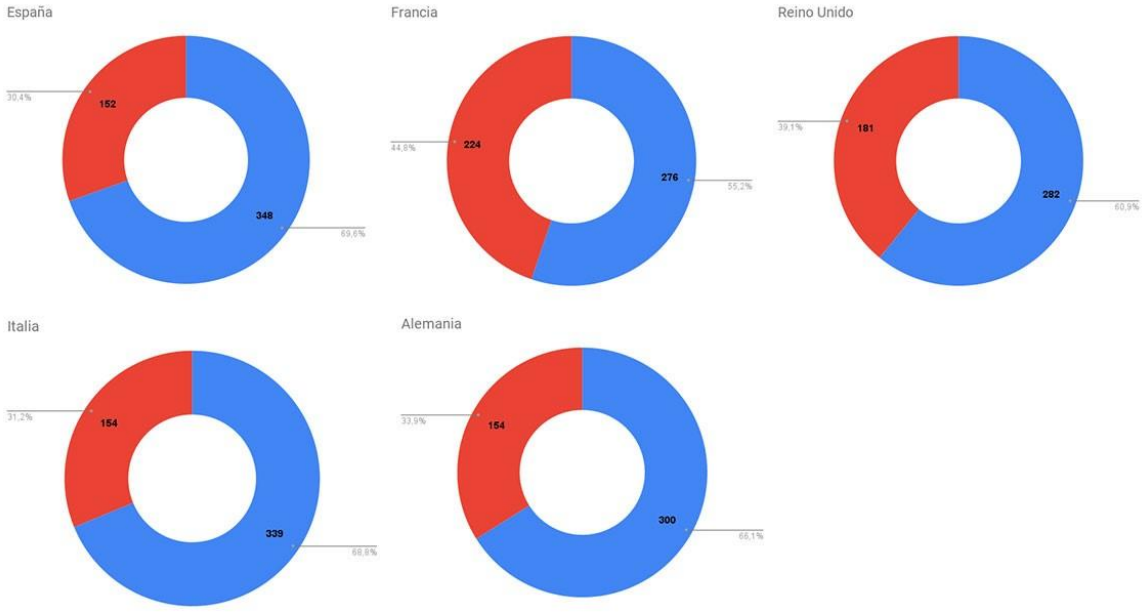
Figure 1: *Use of data journalism techniques in the publications of European fact-checkers. Segmentation: global.*



Source: Elaborated by the authors.

Detailed observation of each country yields similar results. The following figure shows the results in this regard.

Figure 2: *Use of data journalism techniques in European fact-checkers' publications. Segmentation: sample countries.*



Source: Elaborated by the authors.

All the countries in the sample have a percentage of content with data journalism techniques above 30%: Spain (30.4%), Italy (31.2%) and Germany (33.9%) are the closest to the global average. France and the United Kingdom, with 44.8% and 39.1% of publications with data journalism respectively, stand out above the average.

The approach to data of the vast majority of French fact-checkers is unique within the sample, with up to four of them above 40%: Vrai ou Fake (42%), Les Verificateurs (44%), Check News (42%) and, above all, Les Décodeurs (74%). Only 20 Minutes. Fake Off breaks the general trend (22%). In the British context, BBC Verify (42%), Channel 4 (54%) and Full Fact (55%) are the media that stand out for their use of data journalism.

Germany, for its part, has three media outlets with a significant output of data-driven publications: CORRECTIV (38%), ZDFheuteCheck (40.74%) and BR24 #Faktenfuchs (42%). Italy provides two media with a very clear focus on data-driven reporting: Pagella Politica (76%) and La Voce (69.89%). Finally, in Spain, only Newtral is above the global average (47%).

Table 2. *Percentage of publications using data journalism in the sample media.*

Media	Country	Publications using data journalism techniques (%)
Pagella Politica	Italy	76,00%
Les Décodeurs	France	74,00%
La Voce	Italy	69,89%
Full Fact	United Kingdom	55,00%
Channel 4 FactCheck	United Kingdom	53,97%
Newtral	Spain	47,00%
Les Vérificateurs	France	44,00%
BBC Verify	United Kingdom	42,00%
BR24 #Faktenfuchs	Germany	42,00%
CheckNews	France	42,00%

Vrai ou Fake. France TV	France	42,00%
ZDFheuteCheck	Germany	40,74%
CORRECTIV	Germany	38,00%
GLOBAL		**35,89%**
Verificat	Spain	33,00%
EFE Verifica	Spain	32,00%
dpa-Faktencheck	Germany	27,00%
Reuters Fact Check	United Kingdom	27,00%
AFP Faktencheck	Germany	25,00%
Logically	United Kingdom	23,00%
20 Minutes Fake Off	France	22,00%
Maldita	Spain	21,00%
AFP Factual	Spain	19,00%
Open	Italy	6,00%
Facta	Italy	5,00%
Bufale	Italy	2,00%

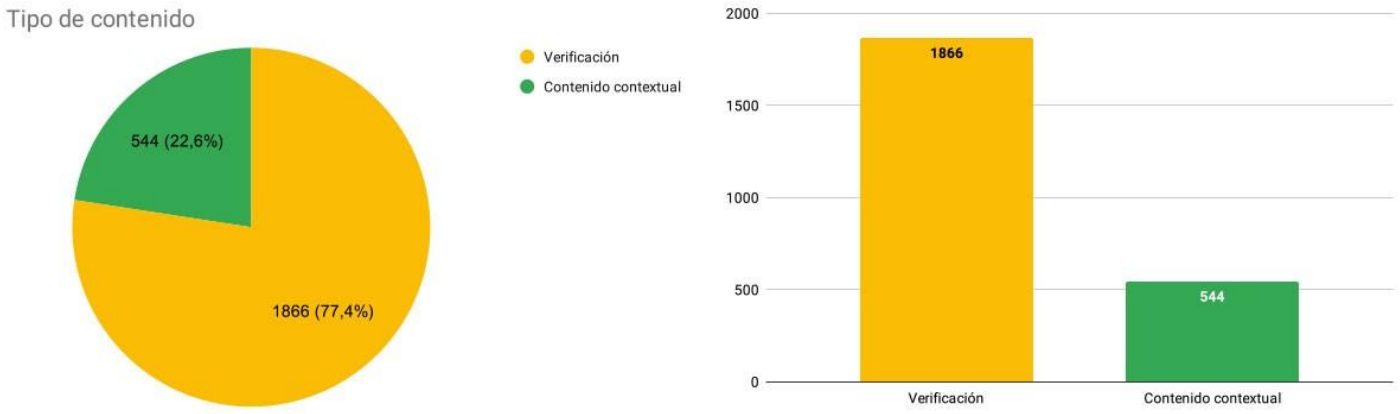
Source: Elaborated by the authors.

Observation of every medium shows that 13 of the 25 fact-checkers are above the overall average and, in all but one case, the percentage is above 40%. For a large proportion of these fact-checkers, working with data has been essential.

4.2. What is the COVID-19 content strategy of the media in the sample and what role does data journalism play in it: do they only publish fact checks or do they complement these with other types of content?

At a global level, the results show that European fact-checkers focus their strategy on the production of verifications (77.4% of the content), which they support with reports, news, analysis and other genres, classified as contextual content (22.6%).

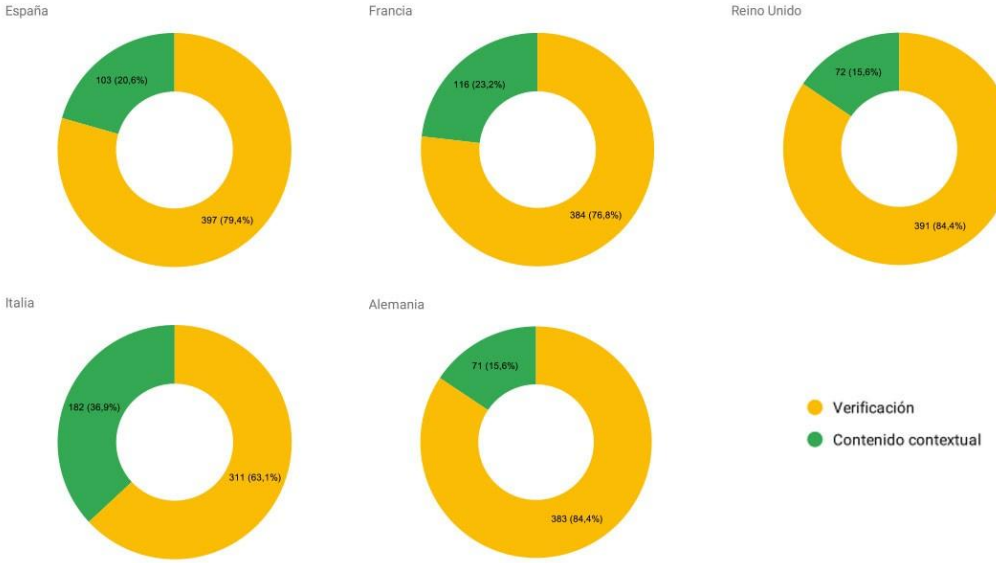
Figure 3: *Typology of content being published by the fact-checkers in the sample: verification vs. contextual content. Segmentation: global.*



Source: Elaborated by the authors.

This proportion is similar in all the countries in the sample, except in Italy, where contextual content accounts for 36.9% of the pieces published. Such percentage finds its justification in the higher volume of contextual content published in three news outlets: La Voce (97.8%), Pagella Politica (46%) and Bufale (36%).

Figura 4: *Typology of content being published by fact-checkers: fact-checking vs. contextual content. Segmentation: countries*



Source: Elaborated by the authors.

The breakdown per media shows that all fact-checkers have a clear focus on verification (with a 70/30 ratio for fact-check vs. contextual content) except for La Voce, Les Décodeurs, ZDFheuteCheck, Pagella Politica, Newtral, Bufale and BBC Verify. In these media the ratio is more balanced and in some of them the volume of contextual content is higher.

Tabla 3. *Typology of content published by fact-checkers: fact-checking vs. contextual content. Segmentation: media.*

Media	Fact-checking	Contextual content
La Voce	2	91
Les Décodeurs	46	54
ZDFheuteCheck	6	48
Pagella Politica	54	46
Newtral	57	43
Bufale	64	36
BBC Verify	64	36
Maldita	72	28
Vrai ou Fake. France TV	72	28
Les Vérificateurs	73	27
Channel 4 FactCheck	37	26
EFE Verifica	75	25
BR24 #Faktenfuchs	85	15
Full Fact	90	10
CORRECTIV	92	8
Verificat	93	7
CheckNews	94	6
Facta	94	6
Open	97	3
20 Minutes Fake Off	99	1

AFP Faktencheck	100	0
dpa-Faktencheck	100	0
AFP Factual	100	0
Logically	100	0
Reuters Fact Check	100	0

Source: Elaborated by the authors.

A deeper dive into the data reveals a strong relationship between data journalism and contextual content (55.51% of the content), above fact checking (30.17%). The following tables (Tables 4 and 5) show the percentage share of each type of content (contextual content vs. fact checking) of the media in the sample and, within them, the proportion of information produced using data journalism techniques.

Table 4. *Relationship between the type of content and the volume of content produced with data journalism techniques. Segmentation: contextual content.*

Media	% of contextual content	% of publications using data journalism techniques
La Voce	97.85%	69.23%
ZDFheuteCheck	88.89%	37.50%
Les Décodeurs	54.00%	83.33%
Pagella Politica	46.00%	82.61%
Newtral	43.00%	74.42%
Channel 4 FactCheck	41.27%	57.69%
BBC Verify	36.00%	58.33%
Bufale	36.00%	2.78%
Maldita	28.00%	50.00%
Vrai ou Fake. France TV	28.00%	46.43%
Les Vérificateurs	27.00%	59.26%
EFE Verifica	25.00%	24.00%
BR24 #Faktenfuchs	15.00%	20.00%
Full Fact	10.00%	70.00%
CORRECTIV	8.00%	62.50%
Verificat	7.00%	57.14%
Facta	6.00%	16.67%
CheckNews	6.00%	0%
Open	3.00%	0%
20 Minutes Fake Off	1.00%	0%
AFP Factual	0%	0%
AFP Faktencheck	0%	0%
dpa-Faktencheck	0%	0%
Logically	0%	0%
Reuters Fact Check	0%	0%

Source: Elaborated by the authors.

The first table, listed from highest to lowest according to the volume of contextual content, reveals a direct correlation between contextual content and the use of data journalism techniques. Media such as La Voce, ZDFheutecheck, Les Décodeurs, Pagella Politica, Newtral and Channel 4 Factcheck generate a percentage of contextual content above 40%, of which the vast majority includes data journalism techniques, as can be seen in the percentages in the table, above 50% in all but one example. These fact-checkers replicate this ratio of

proportionality in the verifications (see table 5), which shows clear strategic approaches to the use of data techniques. There are very high percentages in prominent examples such as Les Décodeurs (63%), Pagella Politica (70%), Channel 4 (51.35%) or Full Fact (53.33%). However, in the following table it is easy to notice a tendency towards a reduction in the presence of data journalism the higher the percentage share of fact-checking.

Table 5. *Relationship between the type of content and the volume of content produced with data journalism techniques. Segmentation: fact checking.*

Media	% of fact checking	% of publications using data journalism techniques
La Voce	2.15%	100.00%
ZDFheuteCheck	11.11%	66.67%
Les Décodeurs	46.00%	63.04%
Pagella Politica	54.00%	70.37%
Newtral	57.00%	26.32%
Channel 4 FactCheck	58.73%	51.35%
BBC Verify	64.00%	32.81%
Bufale	64.00%	1.56%
Maldita	72.00%	9.72%
Vrai ou Fake. France TV	72.00%	40.28%
Les Vérificateurs	73.00%	38.36%
EFE Verifica	75.00%	34.67%
BR24 #Faktenfuchs	85.00%	45.88%
Full Fact	90.00%	53.33%
CORRECTIV	92.00%	35.87%
Verificat	93.00%	31.18%
Facta	94.00%	4.26%
CheckNews	94.00%	44.68%
Open	97.00%	6.19%
20 Minutes Fake Off	99.00%	22.22%
AFP Factual	100.00%	19.00%
AFP Faktencheck	100.00%	25.00%
dpa-Faktencheck	100.00%	27.00%
Logically	100.00%	23.00%
Reuters Fact Check	100.00%	27.00%

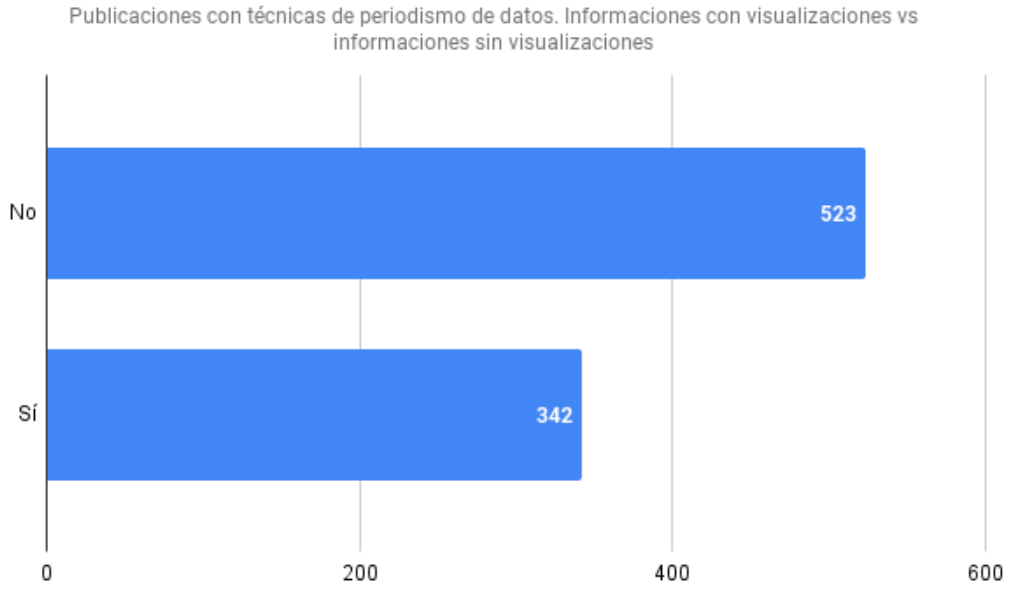
Source: Elaborated by the authors.

Another noteworthy feature is the link between data journalism and news reporting. Overall, the percentage share of this genre within contextual content increases when data techniques come into play (73.8% of content with data journalism, 52.5% of content without data journalism). In addition, out of the 350 pieces of content published as news stories, 63% involved data techniques.

4.3. What is the level of adoption and application of data journalism techniques by the sampled fact-checkers?

Bradshaw's (2011b) communication pyramid model is taken as a reference to determine the degree of development of data journalism in a publication, being the presence of visualizations the main element of analysis. The following figure describes the scenario in European fact-checking with respect to this issue.

Figure 5: *Presence of visualizations in publications with data journalism techniques. Yes (there is visualization) vs No (there is no visualization).*



Source: Elaborated by the authors.

Overall, European fact-checkers have opted for narrative formulas, avoiding visualizations, to generate information with data: 523 pieces of content out of a total of 865 (60.5%). The pieces of information containing visualizations account for 342 out of 865 (39.5%).

A detailed analysis of each of the media in the sample sheds light on this issue.

Table 6. *Publications with data journalism techniques containing visualizations. Count and percentage. Segmentation: media.*

Media	Publications with data journalism containing visualizations	Publications with data journalism containing visualizations (%)
BBC Verify	42/42	100.00%
La Voce	56/65	86.15%
ZDFheuteCheck	16/22	72.73%
Les Décodeurs	50/74	67.57%
Newtral	28/47	59.57%
Maldita	12/21	57.14%
CORRECTIV	21/38	55.26%
Pagella Politica	39/76	51.32%
BR24 #Faktenfuchs	21/42	50.00%
Bufale	1/2	50.00%
AFP Factual	8/19	42,11%
GLOBAL	342/865	39.54%
Open	2/6	33.33%
Vrai ou Fake. France TV	11/42	26.19%
Les Vérificateurs	11/44	25.00%
AFP Faktencheck	5/25	20.00%
Facta	1/5	20.00%
Verificat	6/33	18.18%

CheckNews	6/42	14.29%
Full Fact	4/55	7.27%
20 Minutes Fake Off	1/22	4.55%
Channel 4 FactCheck	1/34	2.94%
dpa-Faktencheck	0/27	0%
EFE Verifica	0/32	0%
Logically	0/23	0%
Reuters Fact Check	0/27	0%

Source: Elaborated by the authors.

The presence of visualizations is significant in 11 out of the 25 media in the sample, which are above the global average (39.45%). The volume of publications with visualizations, either created with specialized software or with their own programming, and the percentage they represent with respect to the total number of publications with data indicate an approach and capacity for the production of advanced data journalism. However, it is important to analyze how these visualizations involve the other stages of data journalism communication. The following table provides data in this regard.

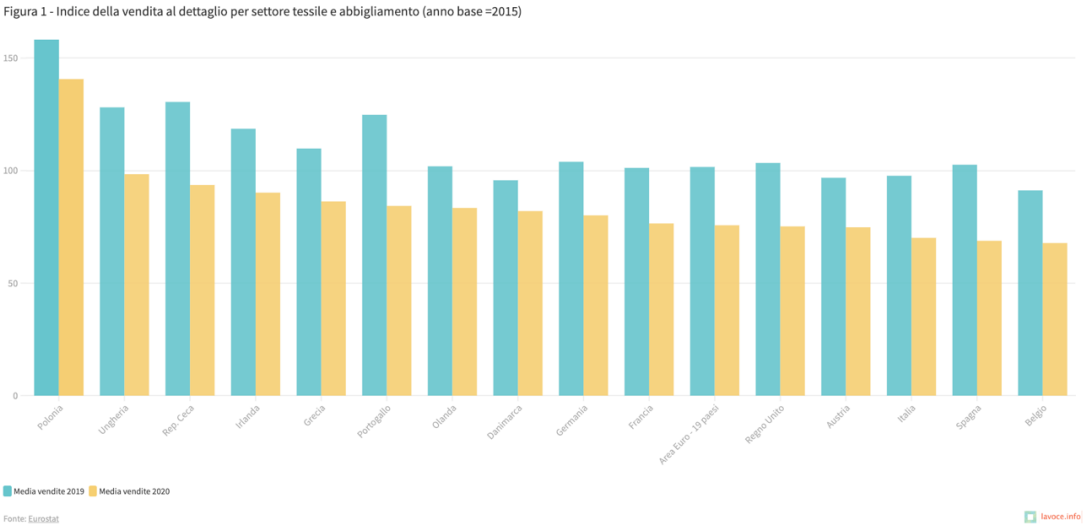
Table 7. *Stages of data journalism communication in the sample media. Yes (affirmative answer) vs No (negative answer).*

Visualization	Narrative	Social Communication	Humanization	Customization	Use	Total
No	**Sí**	No	No	No	No	523
Yes	**Yes**	**Yes**	No	No	**Yes**	257
Yes	**Yes**	No	No	No	**Yes**	53
Yes	**Yes**	**Yes**	No	**Yes**	**Yes**	17
Yes	**Yes**	No	No	**Yes**	**Yes**	4
Yes	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	4
Yes	**Yes**	**Yes**	**Yes**	No	**Yes**	3
Yes	**Yes**	No	No	No	No	3
Yes	**Yes**	No	**Yes**	**Yes**	**Yes**	1

Source: Elaborated by the authors.

Most of the pieces with visualizations include Narrative, Social Communication and Use (257). These are, in most cases, visualizations that are either created with their own means and included as images, a common practice in BBC Verify, for example. They are also visualizations created with specialized third-party software, such as Flourish and Datawrapper, whose visualizations include specific functionalities for rebroadcasting and/or use through interactive elements such as filters or highlights. La Voce, Pagella Politica and Newtral stand out in this group. La Voce, a media that specializes in economics, addresses most of its topics from a data perspective. Thus, it supports most of its articles with infographics or visualizations produced with Datawrapper or Infogram, enriching the textual narrative. The following visualization was published in an article entitled “Crisi da COVID, i settori più e meno colpiti (The COVID crisis, the most and least affected sectors)”, which explains which economic sectors have suffered most and least from the pandemic.

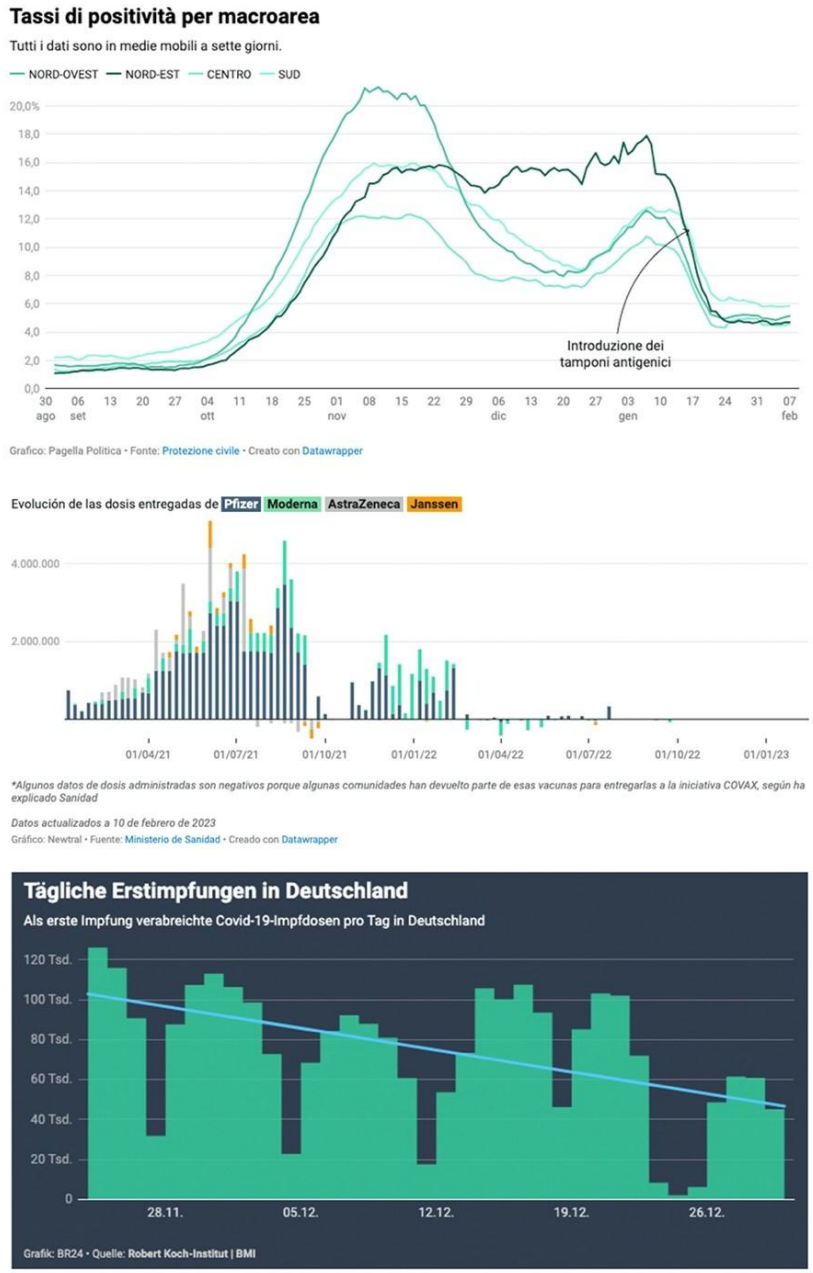
Figure 6: *Example of a bar chart created with Flourish.*



Source: lavoce.info

Pagella Politica, BR24 #Faktenfuchs and Newtral follow the same strategy, but abandon the thematic specialization and address issues such as the evolution of the pandemic (in number of infections, admissions, ICU and deaths), COVID regulations (masks, mobility restrictions and their effects) and above all and especially, the evolution of vaccination, the topic with the most prominence. Most of the pieces incorporating visualizations in this group belong to contextual content. The following visualizations have been published, respectively, in “Epidemia: l'Italia galleggia, ma Bolzano e una parte del Centro preoccupano (Epidemic: there is concern about Italy's Galician, Bolzano and a part of Downtown)”, “Vacunación COVID en España: así evoluciona la inmunización” (COVID vaccination in Spain: this is how immunization is evolving) and “#Faktenfuchs: Radikalisieren sich die Maßnahmen-Gegner?” (#Faktenfuchs: Are the opponents of the measures becoming radicalized?) (Newtral, n.d.)

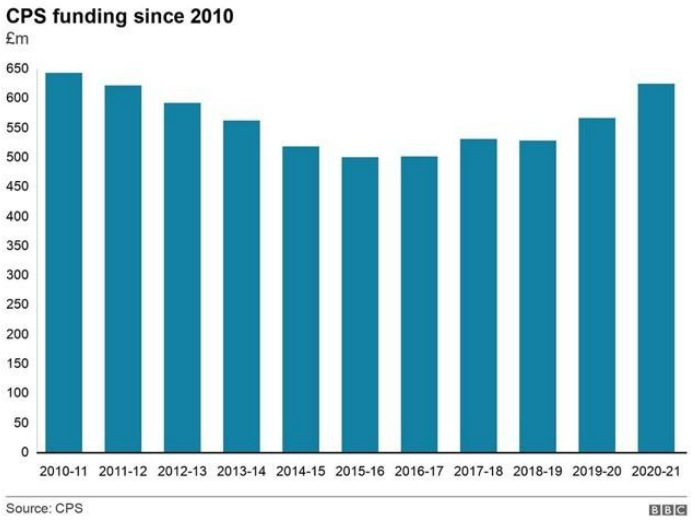
Figure 7. *Examples of visualizations generated with Datawrapper.*

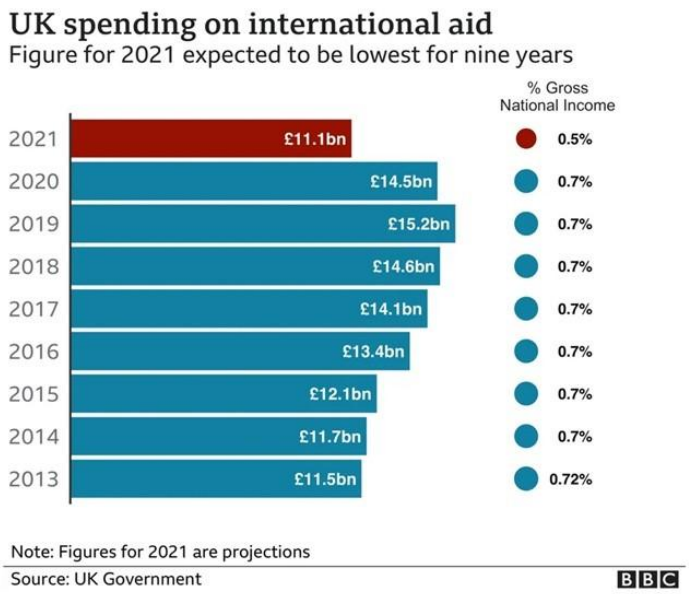


Source: pagellapolitica.it, newtral.es and br.de

Another approach is that of BBC Verify, which includes visualizations as images, an element that facilitates their easy rebroadcasting by any user, but limits the interaction options. With an approach much more linked to first-wave fact-checking, monitoring political discourse, visualizations appear as key elements to disprove falsehoods or inaccuracies of British politicians. This work is combined with context pieces of information: vaccination, evolution of the pandemic, COVID regulations in the UK, etc. The figure below shows a couple of visualizations that contribute to the verification of the statements of the then British Prime Minister, Boris Johnson, in the article “Boris Johnson: The prime minister's claims fact-checked” (BBC News, 2021).

Figure 8: *Examples of static visualizations created with own resources in BBC Verify.*

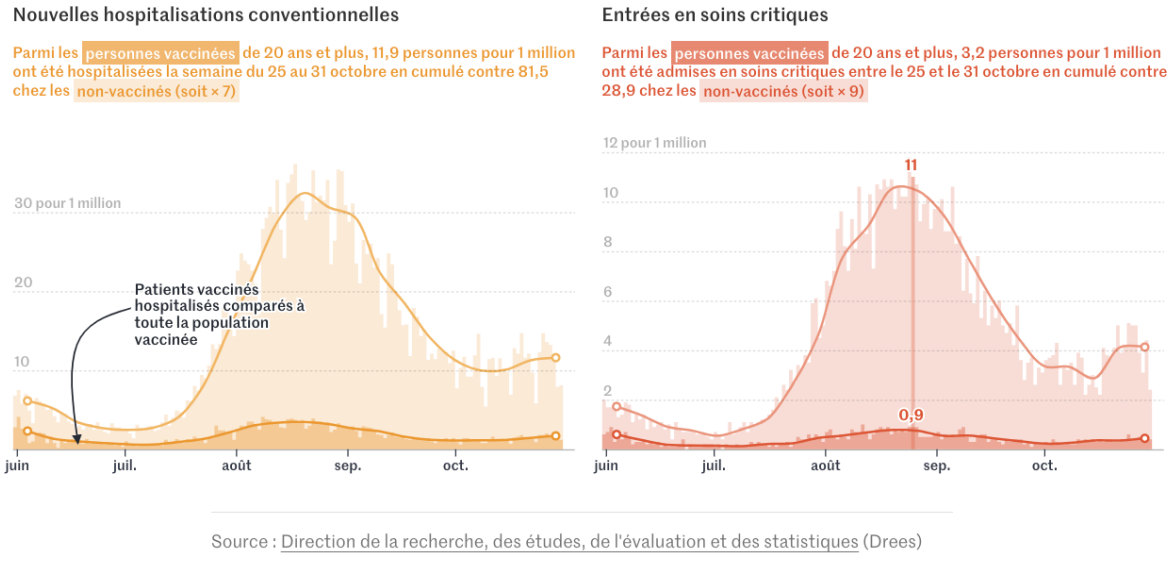




Source: bbc.co.uk

The second group of pieces of information with visualizations adds only Narration and Use (53 publications). This is the predominant model in Les Décodeurs, for example. Their visualizations, developed with their own programming resources, add the aforementioned use functionalities, but none of these are focused on social communication. Their redistribution through social networks or their insertion in other platforms is not facilitated. Besides this element, the visualizations include simple interaction elements such as filters or highlights. The visualization below was published in the article "Cinquième vague de COVID-19: les non-vaccinés sont toujours les plus nombreux en soins critiques" () and illustrates the difference in admissions of people who are vaccinated and unvaccinated against COVID.19.

Figure 9: *Examples of interactive visualizations with own resources in Les Décodeurs.*



Source: lemonde.fr

There is a fourth group with a relevant number of pieces of information: Visualization, Narration, Social Communication, Customization and Use (17 publications). In most of the publications in this group there are two protagonists: Pagella Politica and BBC Verify. The Italian medium incorporates, in a generic way, visualizations created by the portal ourworldindata.org. This is a portal with a high standard in terms of good

data journalism practices: it allows access to and download of the database from which the visualization was generated, offers multiple functionalities for use, customization and social communication and, in addition, notes and methodological explanations on the data being used. The example below was published in the article "Il fact-checking del nuovo libro di Renzi" (The fact-checking of Renzi's new book).

Figure 10: *Example of interactive visualization of Our World in Data included in Pagella Politica.*

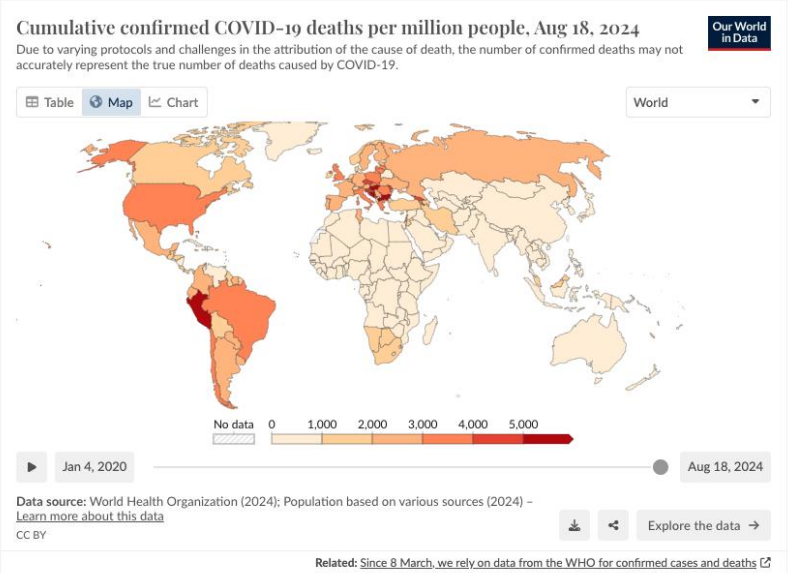
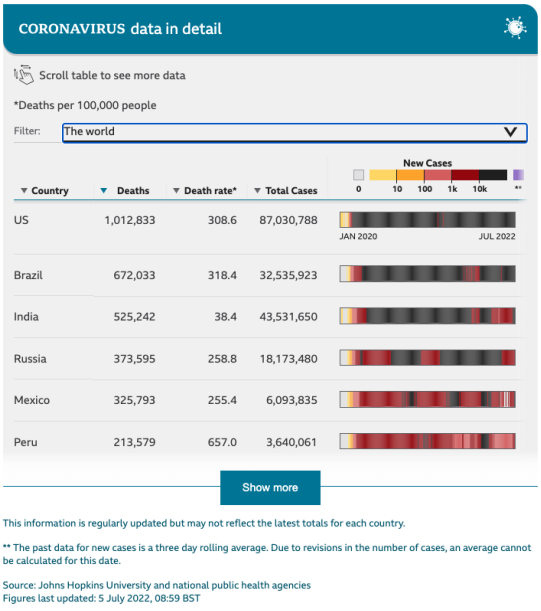


Grafico 1. Rapporto tra morti Covid-19 diagnosticati e popolazione – Fonte: Our world in data

Source: pagellapolitica.it

In turn, the British media has generated interactive dashboards with several visualizations and different elements for use and customization. Below there is an interactive dashboard for tracking COVID-19 deaths worldwide, published in article "Does the UK have highest COVID death toll in Europe?"

Figura 11: *Example of interactive visualization generated with proprietary resources at BBC Verify.*



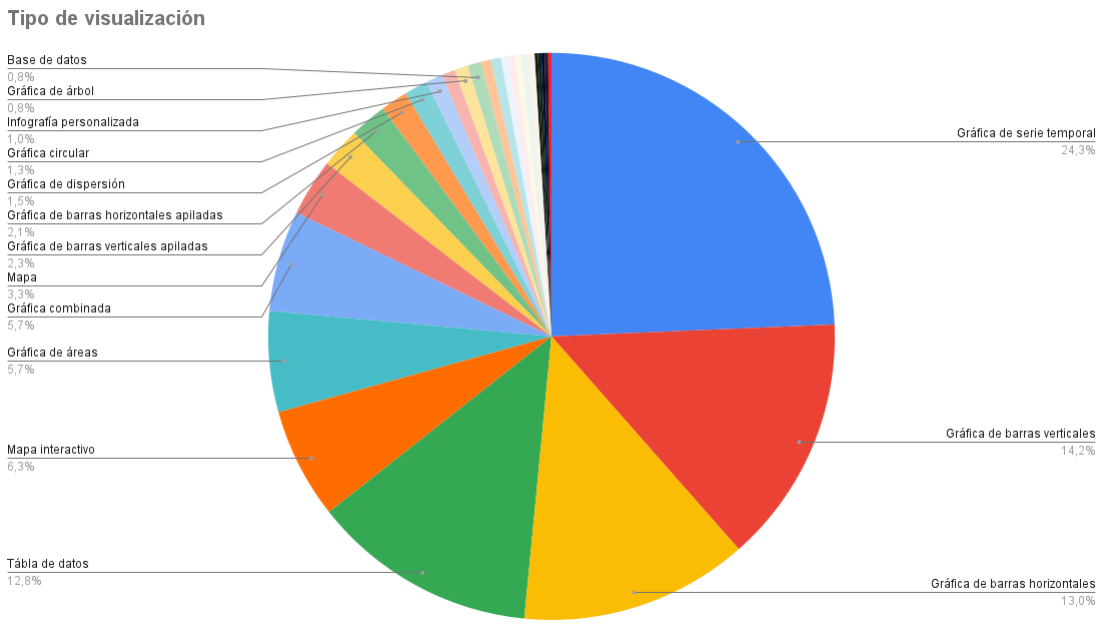
Source: bbc.co.uk

In general, the use of visualizations is clearly expository. The interactive elements included in the visualizations are aimed at filtering or highlighting information: temporal or category filters (type of vaccine, region, demographic) are the most common. These functionalities are provided by specialized software such

as those listed above, which makes it easier for non-specialized professionals to work with data. This approach is the most common among the media that use visualizations. On the other side is Les Décodeurs, which is the most prominent media in the creation of visualizations, since all of them have been developed with its own resources.

As a follow-up to the review of the use and treatment of visualizations, the data from the content analysis clearly reveal the use of a wide range of visualization types by European fact checkers, up to a total of 29.

Figure 12: *Typology of visualizations used by European fact checkers. Segmentation: global.*



Source: Elaborated by the authors.

In terms of countries, the variety is greatest in France (20 types), Italy (18 types) and Spain (17 types). Germany (13 types) and the United Kingdom (10 types) are the countries with the lowest variety. The figure below shows the data at the global level. In more detail, Les Décodeurs (17 types), La Voce (15 types), Pagella Politica (13 types), Maldita (12 types) and Vrai ou Fake (12 types) are the media with the greatest plurality in this area.

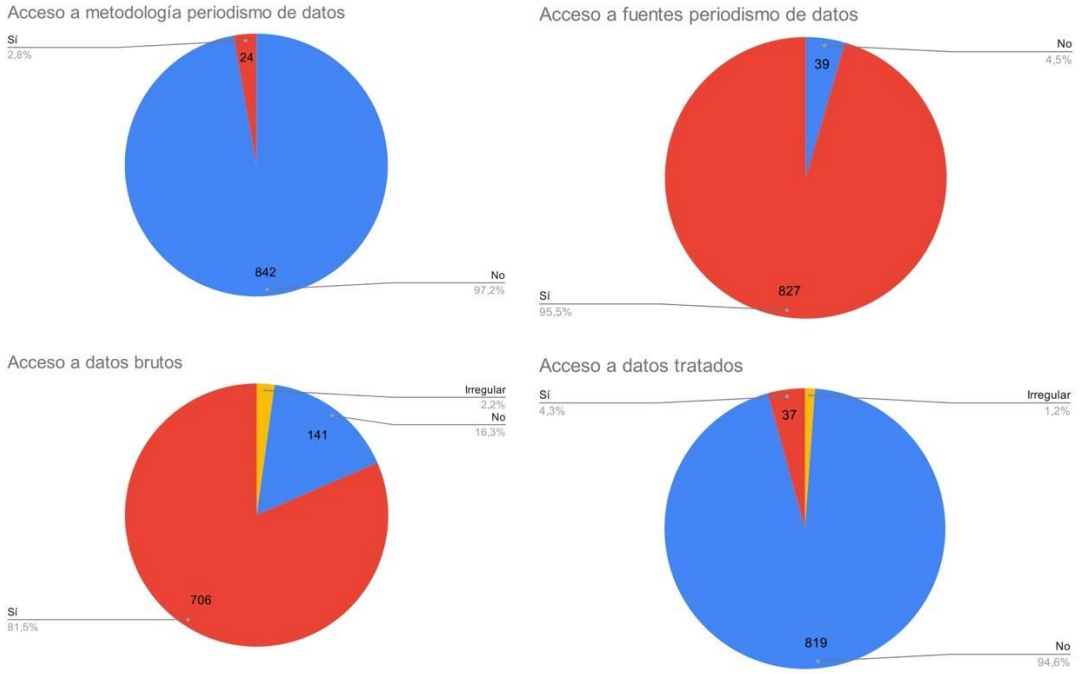
As noted, diversity is manifest, however, the presence of time series graphs (24.3%), vertical bar graphs (14.2%), horizontal bar graphs (13%) and data tables (12.8%) stands out above the rest. The distinction between fact-checks and contextual content does not reveal different patterns, except for percentage nuances.

There are also no significant distinctions between countries: except in the United Kingdom, where it ranks second with 25% behind the horizontal bar chart (26.4%), the time series chart is the most used type of display in all countries: Spain (21.3%), France (21.4%), Italy (27.5%) and Germany (25%). Among the five media with the most diverse repertoire of visualizations, this preference for time series graphics also appears: Les Décodeurs (18.3%), La Voce (26.5%), Pagella Politica (27.4%), Maldita (25%) and Vrai ou Fake (20%). The tendency towards time series graphs or other visualizations with similar narrative utilities, vertical bar graphs, for example, reflect a use derived from the need to count the evolution of the pandemic in key data: number of infections, admissions, people in ICU, people dead, infection rate or percentage of people vaccinated and the number of doses.

In this regard, maps are also relevant, they help to see the evolution by territory and, although their use has been less frequent, they appear recurrently in most of the sample.

The importance of transparency as a procedural and legitimizing element in the work of verifiers and data journalists has been highlighted above. The content analysis has focused on the rigor of the fact-checkers in relation to this matter in those publications in which they have used data journalism techniques. The results are shown in the following graph.

Figure 13: *Level of data journalism transparency: access to methodology, access to sources, access to raw data and access to processed data. Segmentation: global.*



Source: Elaborated by the authors.

In the light of the data, it is clear that European fact-checkers have invested very little effort in explaining the methodology used to develop their information with data. This is mentioned in only 2.8% of the publications. The same is true for the treatment of the data used, which appears in only 4.3% of the publications. On the other hand, verifiers show almost total transparency in terms of access to sources (95.5%) and access to raw data (81.5%). This access is usually through links to specialized data websites or to documents containing data.

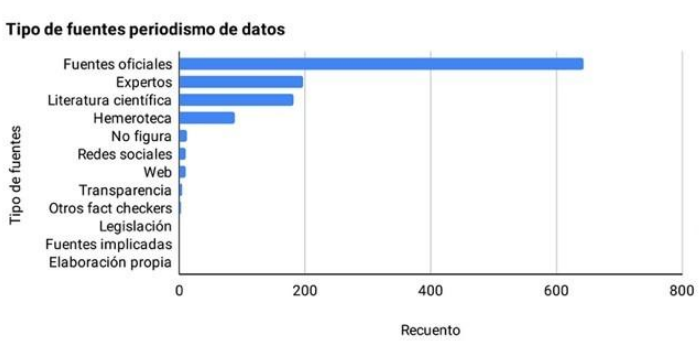
The irregular category, 2.2% for access to raw data and 1.2% for access to processed data, refers to those publications with more than one visualization where some of them do offer the information, while the others do not. The data suggest that the fact-checkers establish as sufficient the placement of access to raw data. Thus, the databases processed would be part of the know-how about data that each medium has and that they are reluctant to share. Be that as it may, there is no methodology section, the media that have exhibited best practices, such as Maldita, attach a methodology section at the end of each piece of information, an undoubtedly useful formula - where these details are explained. Certainly, the media with the best transparency parameters is Pagella Politica, being the fact-checker with the greatest access to processed data (27.6%), maintaining figures in average in the rest of the parameters.

In any case, both in terms of countries and media, and even when attention is paid to affiliation, media vs. independent, or type of content, fact-checking vs. contextual content, the trend is general: total transparency in access to sources and raw data, and almost total opacity in access to methodology and access to processed

data. In other words, in general, fact-checkers do not fully transfer their transparency practices to the production of information with data. In any case, access to sources makes it possible to trace an X-ray of the most frequent data providers for these media. The analysis has made it possible to identify 12 different types of sources. The following figure lists them and shows their frequency as a percentage.

Figure 14: *Typology of data journalism sources used by European fact-checkers. Segmentation: global.*

Tipo de fuentes periodismo de datos	Recuento	%
Fuentes oficiales	643	55,86%
Expertos	197	17,12%
Literatura científica	181	15,73%
Hemeroteca	89	7,73%
No figura	12	1,04%
Redes sociales	10	0,87%
Web	9	0,78%
Transparencia	5	0,43%
Otros fact checkers	2	0,17%
Legislación	1	0,09%
Fuentes implicadas	1	0,09%
Elaboración propia	1	0,09%



Source: Elaborated by the authors.

Whenever there is plurality, one type is clearly positioned above the rest: official sources (55.9%). They are followed at a distance by experts (17.1%), scientists, economists, universities, specialized portals, scientific literature (15.6%) and the newspaper library (7.7%), both their own and those of third parties. The table is completed by sources with much less relevance in terms of numbers: social networks, web, transparency requests, other fact-checkers, etc. The data only show the monitoring that the European fact-checkers carried out on the main generator of data on the evolution of the pandemic: public administrations at different levels. In terms of countries, there are differences in the greater or lesser percentage share that the analyzed media have given to official sources, with Spain (58.4%) and Germany (70.3%) in the lead, and the alternation between scientific literature and experts as the second most recurrent source.

5. DISCUSSION AND CONCLUSIONS

The results shown in terms of the presence and development of data journalism in the work of European fact-checkers in the fight against disinformation on coronaviruses confirm the existence of a solid link with it. This affirmation is supported by the presence of data journalism techniques in 35.9% of the publications in the sample. Beyond this overall figure, the data for each country show the presence of data journalism in similar percentages and always above 30%, with France being the country that stands out the most in this field. The evidence is completed by the percentage share of information with data in more than half of the fact checkers in the sample: Pagella Politica, Les Décodeurs, La Voce, Full Fact, Channel 4 FactCheck, Newtral, Les Verificateurs, BBC Verify, BR24 #Faktenfuchs, CheckNews, Vrai ou Fake: France TV, ZDFheuteCheck and CORRECTIV.

Most of these media are, prominently within the sample, representative of a content strategy based on a two-pronged approach in which data journalism plays a leading role: accompanying fact-checks with a wide range of contextual content, mainly news reports and news. In this way, in the face of the proliferation of misinformation on a given issue, the necessary fact-checks are produced and, under slow and leisurely consumption formats, the user is provided with context and knowledge. It is in this type of content where data plays its most relevant role. Thus, data techniques appear more frequently in explanatory pieces of information that include in-depth explanations of a topic. This reinforces the link between data journalism and investigative journalism (Casero-Ripollés & López-Meri, 2015; Blanco-Castilla et al., 2016).

It is also in news reporting that the greatest efforts to produce content with data are found, with narratives that combine several visualizations and textual development, on a wide range of topics (vaccination, pandemic evolution, COVID regulations...) and under forms of headlines that are written around a question that requires a numerical answer. In the field of verification, data journalism is generally used in a much more superficial way in the communication phase (Bradshaw, 2011b): visualizations appear less frequently and explanations are made in textual form. It is likely that response and production times are much shorter in this type of content, which leads to a lower use of visualizations, since it is a more demanding format in terms of resources and production deadlines.

On the other hand, the analysis has allowed generating a classification of fact checkers based on their relationship with data journalism. These range from those with a high use of data journalism, in an advanced stage, use of visualizations and monitoring of the different stages of Bradshaw's (2011b) communication pyramid, to a minimal presence and with a very basic development, textual narrative of data, reduced inclusion of visualizations that are not normally internally developed.

Thus, the first group, whose only representative is Les Décodeurs, is that of the data media specialized in fact-checking. The fact-checking subsidiary of Le Monde is, in essence, a data journalism media. At Les Décodeurs, data initiates and drives the process of fact-checking and fact-telling, and this approach applies to all subjects. This issue is evident from its own cover letter (Le Monde, 2021) and is materialized in its web architecture, the main sections are: To Understand, In a Graphic, Fact Checks and Data Visualization, and in the data presented in the analysis section: high percentage of content published under the paradigm of data journalism (74%), within which visualizations have a high percentage share (67.6%) and great variety (17 different types). Furthermore, as well as the use of visualizations in different information, there are frequent pages on its website that act as monitoring tables of the evolution of the pandemic, with time graphs, maps, scatter diagrams, etc. All these visualizations are developed using their own means (human and technical) and thanks to a multidisciplinary team; there is no use of third-party software.

The trail of the French fact-checker is followed by the media of the second group, the fact-checkers that mostly use data journalism for content creation. Pagella Politica leads this group, which also includes BBC Verify, Newtral, La Voce, Maldita, BR24 #Faktenfuchs and ZDFheuteCheck. The web architecture of most of them incorporates some section or category specialized in data, information with data is frequent in their agenda and most of them carry out an extensive development of Bradshaw's (2011b) communication pyramid: more than half of them include visualizations - including interaction and dissemination elements - and also very varied, which speaks of a clear focus on data.

However, these visualizations have been created mainly through specialized software: Flourish and Datawrapper are the main ones. It is believed, given this fact, that fact checkers optimize (or do not have) the data journalism resources necessary for daily content production. These resources are allocated in some of these media in the creation of digital tools based on data autonomously. Newtral has created Transparentia to facilitate access to the salary of Spanish public representatives, or in collaboration with other verifiers, the #CoronavirusFacts Alliance is one of the most notable examples, highlighting the culture of collaboration rooted in both journalistic disciplines. It is in the exploration of these tools at the level of design, technical and human resources, collaborative dynamics, transparency and community participation where future research should be focused.

A third group is that of verifiers who rely on data to perform their verifications using data journalism in a basic way. EFE Verifica, Verificat, CheckNews, Full Fact, Channel 4 FactCheck, Les Vérificateurs, Vrai ou Fake, Reuters Fact Check, Logically, dpa-Faktencheck or Correctiv do not have any specialized data section within their fact-checking section, do not generally incorporate visualizations into their work and, if they do, they are not

produced with their own resources. They are visualizations generated by third parties, which these media embed by different means in their publications: insertion of code and screenshots mainly.

There is therefore no processing of the information by a specialized team and the narrative of the data is done through textual explanations. In the last and fourth group are the media with a very low percentage of data journalism: AFP Factual, AFP Faktencheck, 20 minutes Fake Off, Open, Bufale, and Facta.

The classification brings three issues into sharp focus:

1. El The high level of adoption of data journalism in a large percentage of the media in the sample attests to the usefulness of this discipline in the fight against misinformation during the pandemic. In some cases, mainly the media in the first two categories, data journalism drives the fact-checking process to a large extent. The results invite us to think of data journalism as a reinforcement of quality journalism in times of disinformation.

2. The difficulties involved in implementing data journalism, both in terms of human resources - it requires multidisciplinary teams with advanced skills in programming, visualization, data mining, spreadsheet, AI, among others -, training and updating of human teams in all the above areas, access to programs and digital tools - usually expensive and not accessible to usually small fact-checking newsrooms -. All this in a context of acceleration of information cycles where response times are increasingly tight.

3. All of the above determines the strategic choice. In a context of massive production of disinformation such as the pandemic, some of the fact-checkers were able to face disinformation on coronaviruses with an already developed data infrastructure, which allowed them a more complex approach, where disinformation is attacked immediately ("fact-checking") and knowledge and critical capacity are provided (contextual content as a way to media literacy), with the inclusion of a diversity of genres and formats. The narrative of the evolution of the pandemic, based on figures, became a catalyst for this strategy, which is still implemented today in all kinds of topics. As opposed, a majority of fact-checkers whose development of data journalism is basic or non-existent.

A necessary investment in technical resources, the development of AI has brought with it important innovations in the areas of information search, data processing and process automation (Opdahl et al., 2023), and an active promotion of collaborative projects (such as those already mentioned in this paper) are presumed to be the priority lines of work for fact checkers.

This is completed by addressing the issue of transparency, a cornerstone in the work of both disciplines. The results show a need for improvement in two of the parameters of transparency in data journalism: access to methodology and access to processed databases.

One of the main values of data journalism is that it is based on methodological accuracy (Bradshaw, 2011a), with the monitoring of the method by a third party being the main guarantor of veracity. The absence or scarcity of methodological explanations or the availability of the data on which the visualizations are built in the vast majority of the sample show the road that remains to be traveled in this area, since the transparency of sources has shown the predominance of official sources during the pandemic, and access to raw data is almost total. In any case, and taking into account that most of these media are signatories of the IFCN Code of Principles, it seems logical to implement corrective measures in this regard. In this respect, the elevation to a certified standard of the methodology explained in Bradshaw's pyramid (2011a) by an international entity, in the style of the IFCN, would be an effective solution. Its practical application comes from the requirement to include annexes to each piece of information with data, explaining how the data was collected, cleaned and

prepared before being communicated, either through visualizations or text, and allowing the user access to the data processed by the media. This would strengthen another of the main lines of action of fact-checking, the media literacy of citizens to make them less vulnerable to disinformation, by promoting critical thinking, helping to simplify complex information through visualizations and educating about transparency and journalistic processes.

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