

# Data visualization in shaping the institutional COVID-19 narrative

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**ABSTRACT:** This article examines the distortion of data and its visualization in the context of Covid-19 in Italy. While data visualization has become prevalent across various scientific disciplines, it often suffers from being overly intricate, inappropriate for the data type, or capable of causing perceptual biases and data falsification. The surplus of digital data and its subsequent visualization can lead to the manipulation of information, crafting narratives that diverge from official communications and aim to undermine their credibility and accuracy. This article highlights the necessity for properly disseminating data literacy and investigates data visualization’s epistemological and methodological dimensions, focusing specifically on the Italian scenario. Misrepresentation of COVID-19 data is characterized by the distortion and misrepresentation of the pandemic data collected, processed, and presented. Through an empirical case study, the article underscores the imperative to develop and utilize data visualization techniques that faithfully and accurately depict data.

**KEYWORDS:** misrepresentation of data, COVID-19, data visualization, Italy, post-truth



## INTRODUCTION<sup>1</sup>

The digital transformation and the increasing ubiquity of technologies have revolutionized how data is presented and understood, playing a crucial role in sociological contexts. In particular, the widespread use of data visualization techniques has opened new horizons in the field of social sciences, enabling effective and accessible communication of complex information. Digital environments and technologies facilitate the presentation of data in various ways to make it easier for a broad *audience* to interpret and understand them. *Data visualization* techniques (Friendly, 2021, 2008; Engebretsen & Kennedy, 2020; Andrews, 2019) have now become commonplace in several scientific fields (Engebretsen & Kennedy, 2020; Healy & Moody, 2014; Wheeldon & Ahlberg, 2012; Zinovyev, 2011), but they are not always created with the precise needs in mind of the different ‘audiences’ to which the *data-driven* information is addressed (Burawoy, 2021, 2004; Carrigan & Fatsis 2021a; 2021b; Diana, Ferrari & Dommarco, 2021; Schneider, 2014). However, despite the proliferation of such tools, visualizations may turn out to be exaggeratedly complex, inappropriate for the type of data, or, in some cases, even capable of distorting data, fueling confusion, producing perceptual distortions or outright mystification in what we may call a *misrepresentation of data*. In particular, the overabundance of *digital data* and its translation into visualization streams can easily lead to manipulating information to tell different stories to create *other* narratives, which intend to depart from the official communication of institutions and those who represent us. In some cases, such narratives attempt to question the validity and reliability of the institutional communication, thus creating misleading and deceptive representations of the phenomena studied: a work of (de)legitimation that can significantly contribute to giving rise to real ‘post-truths’ and ‘post-factual’ truths (Lynch, 2020; Harambam, 2020a, 2020b; Garrett et al. 2016).

Among the positive effects of the pandemic, there has undoubtedly been an increase in the everyday use of data to make more informed decisions and communicate better with citizens. However, this process has not been accompanied by an adequate dissemination of *data literacy* (Pangrazio & Sefton-Green, 2020; Mcdougall, 2019). People often think it is enough to use a percentage or a graph to automatically render a message more credible and scientific (*the data says so*). Thus, we have witnessed supposed experts, politicians, and journalists dealing with data without a comprehensive understanding of how it should be collected, analyzed, and communicated. Many leaders have started to use the language of data to push their *agenda setting* (McCombs & Shaw, 1972) and, in some cases, openly manipulate, deceive and betray citizens’ trust. There is, in fact, a generalized trust that consists of a set of expectations, formulated under conditions of uncertainty, that others will perform a beneficial, or at least not harmful, action towards them (Lauraño, 2022). Different and manifold reasons have led scientists, politicians, representatives

<sup>1</sup> All citations from Italian sources have been translated into English by the authors.

of institutions, research institutes, or ordinary citizens on various occasions to display and comment in public on graphic representations of the daily trends in the spread of the pandemic.

In some cases, erroneous data were presented, which were inconsistent with the accompanying graphics; in other cases, there may have been deliberate, politically motivated attempts to instrumentalize the data through its graphic and dynamic representation. Examples of each will be analyzed below. A challenge of the digital age is to ensure that data visualization meets the needs of those who consult it, and that the representation is accurate and understandable. The research problem addressed in this article concerns the relationship between data visualization and the construction of narratives in the context of the COVID-19 pandemic (Mathaisel, 2024; Mahanti, 2022). We focus on the Italian context and this relationship's epistemological and methodological implications.

The main objectives of this research are as follows: First, we aim to provide detailed descriptions of data visualization errors in institutional communications and the subsequent public responses in Italy. Second, we seek to explore the challenges related to institutional communication in emergencies, where the need to communicate rapidly often jeopardizes scientific accuracy. Finally, we analyze how scientific narrative and institutional communication can diverge, generating confusion and contributing to the risk of an “infodemic”—the uncontrolled spread of false or misleading information through digital channels.

Our research involves a data analysis methodology that examines institutional documents, public speeches, social media communications, and press conferences related to the COVID-19 pandemic in Italy. This approach allows us to collect primary data and conduct a qualitative analysis of the main themes emerging from the institutional communication of the former Italian Minister of Health, Roberto Speranza. Additionally, we will examine two other cases—the *Sardinia Region case* and the *Lombardy Region case*—which share significant similarities with the *Hope case* and provide further material for discussion. Our analysis aims to explore, through empirical cases, the methodological issues involved in using specific data visualization tools in the construction of narratives, address epistemological aspects, and raise ethical questions related to institutional communication.

## MISREPRESENTING COVID-19 DATA

The contribution presented here focuses on what has recently emerged in the literature under the heading of *misrepresenting COVID-19 data*, i.e., the misrepresentation and distortion of collected, processed, and represented pandemic data. There is already conspicuous scientific literature on the subject, and some are also attempting to make a ‘collection’ of cases of *misrepresentation of Covid-19 data* and to methodologically investigate the phenomenon (Amidon et al. 2021; Atherton, 2021; Doan, 2021; Engledowl &

Weiland, 2021; Bharati & Batra 2021; Homayouni et al., 2021; Lindgren, 2021; Hardesty & Hardesty, 2020). The subjects of analysis of these studies are how data visualization succeeds in influencing and/or supporting policy decisions and proposals on the implementation of public policies in the fields of healthcare, public health, *welfare*, and *wellness* (Lovari & Righetti, 2020; Masick & Bouillon, 2020), as in the case of COVID-19 data. The COVID-19 pandemic has created an unprecedented situation in which the dimension of urgency has also prevailed in institutional communication, which has played a central role in disseminating information on the virus and related prevention and treatment measures (Pagani, Fortunati, & Farinosi, 2023). However, the narrative of scientific data and institutional communication can often diverge, creating confusion and increasing the risk of an ‘infodemic’ (Diana, Ferrari & Dommarco, 2021; Lovari & Righetti, 2020; Manfredi, 2015). The term infodemic refers to the uncontrolled and viral spread of false, biased, or erroneous information, often through social media, which gives rise to and fuels a strong ‘emotional contagion’ (Diana, Ferrari, & Dommarco, 2021) and can cause the breakdown of civil society relations (Manfredi, 2015, p. 4). This phenomenon was particularly evident during the pandemic, with fake news and conspiracy theories spreading rapidly on social media. Institutional communication should be a powerful weapon against infodemics, but it can become part of the problem if it is not appropriately managed.

## SCIENTIFIC KNOWLEDGE AND THE ERA OF POST-TRUTH

In facing epidemics caused by an “unknown” virus, social actors use available information to interpret contagion, leading to narratives in the media, among experts, and the public (Briggs & Martini-Briggs, 2003).

The relationship between scientific expertise and the post-truth phenomenon (Fuller, 2018; McIntyre, 2018), particularly in the social sciences, is significant. Scientific expertise has become increasingly precarious, gaining political and social prominence (Eyal, 2019; Nichols, 2017). This delegitimization process degrades expertise from episteme to doxa, often resolved through political compromise cloaked in technical justifications (Pellizzoni, 2011).

Our main concern is the devaluation of social sciences expertise when disseminated to the public. Discussions on ‘post-truth’ and the ‘erosion of expertise’ (Lewis et al., 2023) often overlook that this devaluation does not affect all fields equally. Specific expert communities and disciplines are more susceptible to scrutiny than others. Historically, a “fact” from the natural sciences had more public impact than one from the social sciences.

The perspective that social science knowledge can be legitimately challenged by politicians, celebrities, and the public is evident in the under-representation of sociology and social sciences in initial media and policy responses to Covid-19 (Pickersgill & Smith, 2021; Diana, Ferrari, & Dommarco, 2021). However, the increasing fragility of the epis-

temic authority of science in the public context does not necessarily weaken its effectiveness. Instead, it seems to strengthen and influence the construction of reality itself, a point often overlooked in the literature on the crisis of expertise.

Luigi Pellizzoni adds big data to examples like biotechnology, ecosystem services, and security policy. The functioning of big data largely depends on ‘expert knowledge’ (Pellizzoni, 2021). Expert knowledge is crucial not only in defining collection and classification processes but also in developing algorithms that identify entities and processes that would otherwise not exist. Expert knowledge in big data has a performative effect, redefining the present, past, and future more strongly than any previous expertise.

Post-truth is not merely a personalization of expert knowledge but an expression of problems in late capitalist society (Pellizzoni, 2021). The emergence of post-truth does not seem simply a reaction to government strategies based on evidence-based decision-making by ruling elites (Baba & Hakem Zadeh, 2012). Instead, it intensifies these strategies through changing methods (Baranowski, 2022).

The dynamic between scientific expertise and post-truth shows the urgency to address data misrepresentation, especially during COVID-19 (Jabkowski, Domaradzki, & Baranowski, 2023). Biased data visualizations have far-reaching implications for public trust, information accuracy, and the relationship between science and society. These elements need careful consideration to bridge the gap between expertise and post-truth challenges.

## METHODS

In this section, we will provide a more detailed account of the methodology adopted for our research, addressing potential limitations and biases to enhance the methodological rigor of the article. This paper examines the relationship between the data narrative and institutional communication during the COVID-19 pandemic. Our methodological approach is based on collecting and analyzing public data and available information on institutional communication concerning COVID-19. We conducted a media analysis on a *case study of misrepresenting COVID-19 data*, called the *Hope Case*, which involved *data visualization* techniques in the context of the pandemic narrative in Italy. The corpus for our analysis was strategically selected to ensure a comprehensive representation of the *Hope Case*. We collected and analyzed various sources, including press reports from reputable newspapers and online news portals, transcripts of public speeches and press conferences delivered by the former Minister of Health Roberto Speranza, and official *tweets*<sup>2</sup> and social media communications related to the case. The diverse nature of these sources allowed us to capture the full spectrum of the data narrative surrounding the case, as well as the institutional communication efforts. Our data collection efforts

<sup>2</sup> Italian Ministry of Health and Istituto Superiore di Sanità (ISI, Italian National Institute of Health).



extended to the period encompassing the emergence of the *Hope Case*, starting from the initial public discourse on the issue. We systematically gathered these sources and cataloged them for analysis. The analysis itself was conducted using the qualitative content analysis method. We applied coding procedures to identify recurring themes, messages, and narratives present in the collected data, to compare the data narrative with the institutional communication so that any discrepancies could be identified and to examine how these discrepancies may have influenced and/or modified the public perception of the pandemic. The coding process was iterative, involving multiple researchers to ensure inter-coder reliability and the validity of our findings. In addition to the *Hope Case*, we have briefly considered two other case studies (the *Sardinia Region Case* and the *Lombardy Region Case*) to provide a comparative dimension to our research. These cases were selected due to their substantial similarities with the *Hope Case* and to support the initial hypotheses of our study. Our analysis, therefore, aims to investigate, through empirical cases, the methodological issues involved in the use of specific *data visualization* research tools in the creation of a narrative that often also produces dissonance at an epistemological level, undermining the foundations of our disciplines and posing an ethical problem (Garrett & Weeks, 2017).

While our methodology was designed to provide a comprehensive view of the *Hope Case*, we acknowledge certain limitations and potential biases in our approach. One limitation is related to the availability of data. The data we analyzed were publicly accessible, so we could not explore internal communications or deliberations that may have occurred within government bodies. This limitation implies that some aspects of the decision-making process and the origins of certain data visualizations may remain obscured. Biases in the data may also exist (Olteanu et al., 2019; Collier & Mahoney, 1996), as our analysis relied on information generated and disseminated by multiple stakeholders. These stakeholders could have their own agendas, potentially influencing the information provided or withheld. Additionally, our analysis may be subject to the biases present in media reporting, as news outlets may emphasize specific aspects of the case, contributing to potential bias in our data.

### THE HOPE CASE

Roberto Speranza<sup>3</sup> was Italy's Minister of Health throughout the most intense phase of Covid-19, in the government of Giuseppe Conte first and then of Mario Draghi. As such, he was one of Italy's main protagonists of institutional communication during the pandemic. As head and guarantor of public health, he had to deal with a challenging and rapidly changing situation. His role was fundamental in defining strategies to prevent and control the virus's spread and communicating the government's actions to citizens. His presentation of the scientific data focused mainly on the need to maintain social

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<sup>3</sup> *Speranza* means "hope" in Italian.

distancing measures, the importance of increasing the country's *testing* capacity, and the massive vaccination campaign. However, the Italian government's institutional communications also often emphasized the narrative of success in containing the pandemic.

Analyzing Minister Speranza's statements during press conferences and media interviews, we identified some communication challenges. We observed that the Minister tried to communicate in a clear and accessible way to citizens, using simple language and avoiding technical and complex medical terminology. This communicative strategy was necessary in such a case, where one had to try to convey compelling messages to the largest audience of Italian citizens (Battista, 2023). However, the communicative style was also chosen to accommodate the Minister's shortcomings in terms of his own skills, knowledge, and ownership of the scientific language of reference. Speranza is neither a virologist nor an epidemiologist or physician, nor had he dealt with medicine or public health issues before he was appointed Minister of Health.

On the contrary, Speranza has a background as a humanist, with a degree in Political Science from LUISS, a private university based in Rome and linked to *Confindustria*, the association of Italian entrepreneurs, and a doctorate in *History of Mediterranean Europe* from the university of his home city of Potenza in the southern region of Basilicata. The former minister, son of Michele Speranza, former secretary and regional leader of the *Italian Socialist Party* (PSI) in Basilicata at the time of Bettino Craxi and later linked to former Prime Minister Massimo d'Alema at the age of 25 was elected in 2004 with the *Democrats of the Left* (DS) to the Potenza city council where he was appointed town planning councilor from 2009 to 2010, which was also a role far removed from his background and public health issues. He became Minister of Health in the *Conte II* government on 5 September 2019 and found himself projected into the "cosmic catastrophe" (Diana, Ferrari, & Dommarco, 2021) of the pandemic that saw him among the most intransigent interpreters and, often, he would be criticized for his handling of data and the anti-Covid measures indicated in many circumstances at the last moment<sup>4</sup>. In fact, the former minister sometimes communicated sensitive data without providing the necessary context to understand it fully.

## NARRATIVE AND DATA VISUALIZATION

The *Hope case* refers specifically to the intervention of the then Minister of Health at the press conference of the President of the Council of Ministers, Mario Draghi, on 10 January 2022 on the latest anti-Covid measures adopted by the Draghi government in the new year through *Decree-Law No. 1* of 7 January 2022. Seated at the table on this occasion in front of the microphones and cameras of all the Italian newspapers and media were the following: coordinator of the Technical Scientific Committee (CTS), Dr. Franco

<sup>4</sup> So says Giulia Marrazzo in her biographical profile of Speranza in the *Open* newspaper. Source: <https://www.open.online/temi/roberto-speranza/>

Locatelli, university professor and president of the *Consiglio Superiore di Sanità* from 22 February 2019; Education Minister Patrizio Bianchi; Speranza, in his capacity as Minister of Health; and Draghi himself. Speranza was seated to the right of Draghi and took the floor approximately fifteen minutes into the meeting after an introduction by Draghi, a speech by Bianchi, and a few questions from journalists present. His speech was short: two minutes and 27 seconds. At the beginning, he tried to illustrate the situation through a data-driven description:

I believe that the latest decree makes a very important step forward for our country and the reason is very simple: we have now reached an extremely significant percentage of people vaccinated in Italy. This morning at 6 am we were at 89.41% of people over 12 years who have had a first dose. So just over 10 per cent of people over the age of 12 remain unvaccinated at this time in Italy. And yet, this 10 per cent, so this small minority, occupies two thirds of the beds in intensive care and 50 per cent of the beds in the medical area: this is why the government's essential objective is to try to reduce the number of the unvaccinated even further in order to reduce the pressure on our hospitals.

The Minister correctly explains the connection between the statistics: about 10 % of the population occupies two thirds of the intensive care unit (ICU) places. At this point, the Minister shows a graph (*Fig. 1*) printed on an A3 sheet of paper with the logo of the Istituto Superiore di Sanità on it concerning admissions to intensive care units in relation to the anti-Covid vaccination and tries to describe it and its communicative effectiveness:

I would like to show you a chart that was created by the Istituto Superiore di Sanità and which, in my opinion, is stronger than many words, because sometimes pictures are particularly useful and meaningful. This chart is based on 100,000 inhabitants and it tells us that among the non-vaccinated, the little red man who is much larger in this chart, there are 23.2 people per 100,000 inhabitants who go to intensive care: they are the non-vaccinated. You move to the vaccinated with two doses over four months, [and] this figure goes from 23 to 1.5, then falls dramatically and drops even further to 1 when the vaccination takes place in the primary cycle within four months and with the *booster* it goes even [lower]—to 0.9.

These figures are calculated on the progress of the vaccination campaign as of 18 December 2021. On that date, the unvaccinated (which includes those who received their first dose less than 14 days earlier) were more than 6.660 million. Overall, between 19 November and 19 December, an unvaccinated person, once infected, had a risk of ending up in intensive care 15.4 times higher than a person who had received the second dose more than 120 days earlier; 23.1 times higher than a person who had received the second within 120 days; and 25.7 times higher than a person who had received the third dose. At this point, Speranza remarks worthy of a staunch neo-positivist proponent of absolute



scientific determinism:

This chart explains, I think better than many other words, the meaning of the decree we have approved. If we want to reduce the pressure on our hospitals, if we want to save lives, and if we also want, in doing so, to further our country's economic and social recovery; the priority path is to reduce the number of the non-vaccinated, and this is the fundamental choice made by the government and I believe it is one that has full and complete scientific evidence.



Figure 1. A screenshot of Roberto Speranza showing the chart of Istituto Superiore di Sanità.

Source: Ministero della salute, <http://www.quadernidellasalute.it/portale/nuovocoronavirus/dettaglioVideoNuovoCoronavirus.jsp?lingua=italiano&menu=multimedia&p=video&id=2449>

## PLURISEMIOTIC INCONSISTENCIES

Unfortunately, the graphic shown had some inconsistencies, and a few hours later, social media exploded, not because of the Minister's message but because of the errors in the chart. Firstly, the graph displays different data: the ICU occupants are shown according to a normalized base per 100,000 inhabitants. At the same time, a side legend integrates further information: the number in absolute value of the various categories of vaccinated people. The chart shown by Speranza (Figure 2) presents an erroneous visualization of the ratio between the ICU admissions of the vaccinated and the unvaccinated. The graphic shows two bars (in the form of *little men icons*) representing, respectively, unvaccinated and vaccinated in-patients. However, their height did not represent the actual number of in-patients; rather, it represented the percentage of ICU admissions with respect to total admissions.

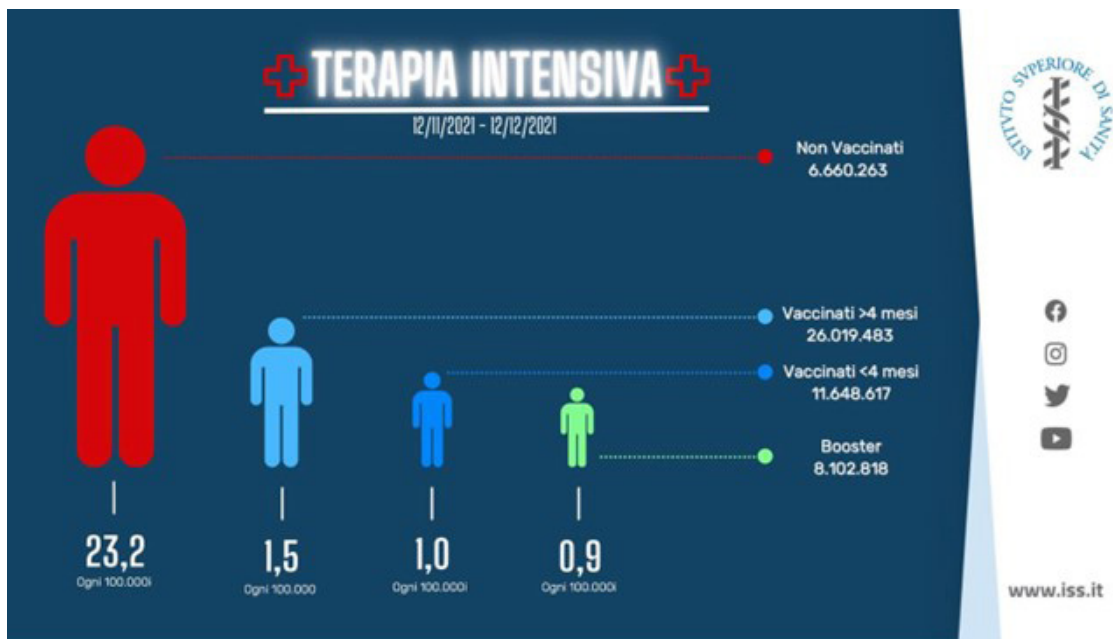


Figure 2. The chart of Istituto Superiore di Sanità illustrated by Roberto Speranza.

Source: <https://m.facebook.com/robersperanza/photos/a.1023378367734706/6812380728834412/>

More specifically, the graph presents the incidence of ICU admissions per 100,000 inhabitants, according to vaccine doses (0, <4 months, >4 months, *booster*): each value corresponds to a pictogram of proportional size. The little red man, the one relating to the unvaccinated, stands out above them all: there are 23 per 100,000, compared to the others on a smaller scale of around 1 per 100,000. The main problem is that the silhouette should be 23 times bigger than the others, whereas it is only 10 times bigger. The surface area was calculated instead of height (although even that was inaccurate), leading to confusion rather than clarity. In this way, the graph creates a false perception of the impact of vaccination on ICU admissions. Paradoxically, although the infographic was intended to show immediately the effectiveness of vaccines in preventing ICU admissions, the image downplays the differences in risk between the unvaccinated and the vaccinated. One of the first to notice the graphical error was Marco Cortella, an active social media user who posted Speranza's graph on *Twitter*, commenting:

The problem with this #dataviz, however, is that the numerical proportions are not respected [...] (neither the height nor the area of the #isotype icons)<sup>5</sup> [...] Having said that, I appreciate the effort to use an alternative mode of communication to the Excel spreadsheet with colored columns, but one must always be correct and not mislead people (whether the purpose is noble or not)<sup>6</sup>.

<sup>5</sup> Tweet published by Marco Cortella on his *Twitter* profile on 10/01/2022. Source: <https://twitter.com/Mcx83/status/1480597675531808776>

<sup>6</sup> Tweet published by Marco Cortella on his *Twitter* profile on 10/01/2022. Source: <https://twitter.com/>

## EMOTIONAL CONTAGION OF THE CASE

It was not long before Cortella's *tweet* was also picked up by *Pagella Politica*, a newspaper dealing with fact-checking and analyzing current political events<sup>7</sup>. A few hours later, Speranza's gaffe *was*, in turn, picked up by the leading press organs, and it was clear what had happened: the figures of the Istituto Superiore della Sanità were accompanied by a visualization that, according to Speranza, was "stronger than many words", but which in fact distorted the sense of proportion. *Sheldon*, a firm of Italian *data-designers*, took up the issue on 13 January and, in addition to highlighting the distortions (*biases*) already noted, tried to visualize the same data in another way, highlighting the many visual and narrative problems of that type of representation<sup>8</sup>. *Sheldon* worked on common data so that they could be comparable; data were presented in percentage terms, precisely as in Minister Speranza's statements; the typical representation of pictograms was avoided, and they opted instead for abstract forms with stacked bar graphs. In the interests of *storytelling*, instead of condensing several concepts within a single graph, *Sheldon* chose to display the information separately in two different graphs: the first shows the percentages of the different types of vaccinated people (Figure 3), the second the places they occupy in the ICU (Figure 4). With respect to the *design*, different choices were made from the original graph (Figure 1): the colors distinguish the graphs, and not the vaccination levels, and emphasis was placed on the unvaccinated, who are the focus of Speranza's message, keeping secondary information in the background. Finally, the second graph (Figure 4) was also designed to provide a second, more usable visualization for the public, where everything that *Sheldon's data-designers* felt was not necessary to convey the message was removed.

This led on 15 January, five days later, to a correction by the *Istituto Superiore di Sanità*, which produced a version with better-proportioned pictograms (Figure 5). The new infographic shows the data from 26 November to 26 December, whereas those shown by Speranza referred to the period from 12 November to 12 December; thus, they were out-of-date data considering that the press conference was held on 10 January 2022 and, evidently, the ISS already had the most recent data on that date. Moreover, comparing the two infographics of the ISS, there are apparent inconsistencies in the data: the one shown by Speranza indicates 6,660,263 unvaccinated. In contrast, the one presented on 15 January by the ISS shows 6,873,205, about 200,000 more. This is clearly impossible, so one can only assume there were errors in the previous one. This can also be seen in the number of *boosters*: from 8,102,818 in the first chart, we go to 5,697,985 in the second, even less.

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Mcx83/status/1480597675531808776

<sup>7</sup> Editor, Speranza's graph on vaccine efficacy contains an error, *Pagella Politica*, 13/01/2022.

<sup>8</sup> Humans and vaccines, a complicated relationship, *Sheldon*, 13/01/2022. Source: <https://medium.sheldon.studio/omini-e-vaccini-una-relazione-complicata-%EF%B8%8F-7b12f71157f4>

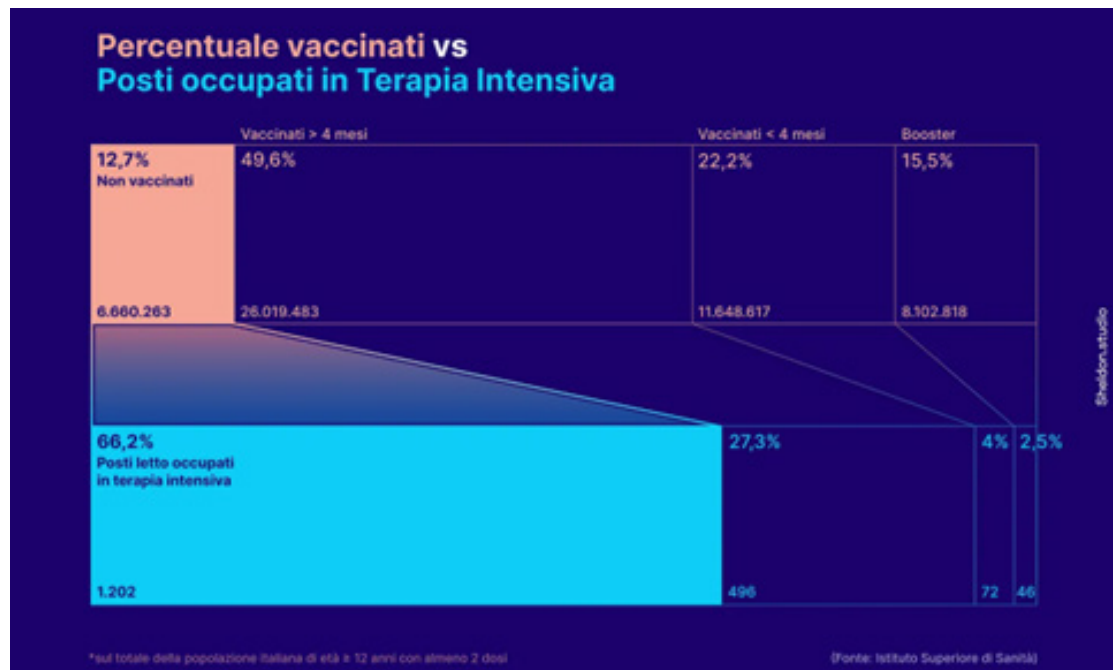


Figure 3. The percentages of the different types of vaccinated people.

Source: Sheldon, <https://medium.sheldon.studio/omini-e-vaccini-una-relazione-complicata-%EF%B8%8F-7b12f71157f4>

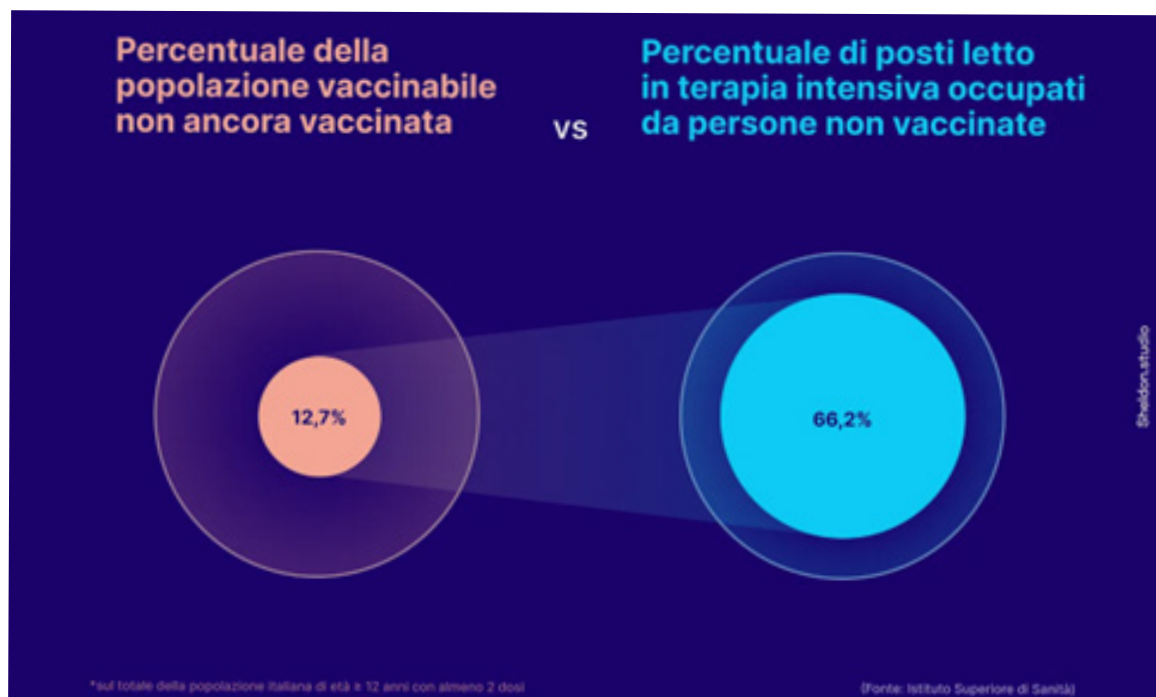


Figure 4. The places that vaccinated people occupy in the ICU.

Source: Sheldon, <https://medium.sheldon.studio/omini-e-vaccini-una-relazione-complicata-%EF%B8%8F-7b12f71157f4>

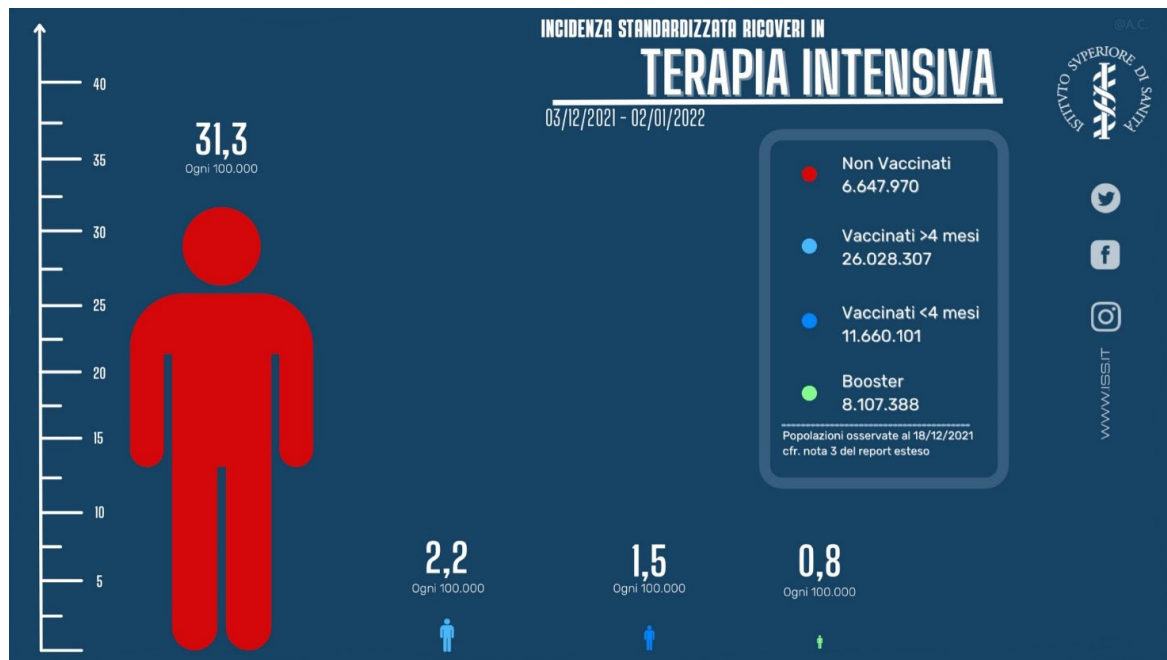


Figure 5. The new infographic of Istituto Superiore di Sanità.

Source: Istituto Superiore di Sanità, <https://twitter.com/istsupsan/status/1484840054988095496>

Cortella (and others) then take up the matter again on 22/01/2022. Cortella points out, in agreement with *Sheldon*, that in this case, it would be better to avoid this kind of representation altogether:

I do not understand why *the Istituto Superiore di Sanità* is insisting on using this representation. As already mentioned, pictograms are not bars, and varying the height also varies the area, introducing a visual distortion<sup>9</sup>.

Finally, Cortella also takes up Lorenzo Ruffino's *tweet*: "If you really wanted to use little men, you could think of an approach like this (done very quickly)" and presents a visualization using little men icons of the standardized incidence of hospitalizations in ICUs over the time indicated by the ISS<sup>10</sup> (Figure 6). The damage to the credibility and reputations of Minister Speranza, WHO super consultant Walter Ricciardi, the ISS, the government and Draghi is illustrated in the many comments to the discussion on *Twitter*: "Your 'very fast' far exceeds in visual effectiveness the 'very thought out' of the ISS!", "Send your CV to the ISS". On 11 January, Franco Bechis, in a reference in *Tempo*, headlines: "All fake: the data of Mario Draghi and Roberto Speranza on no-vax"<sup>11</sup>.

<sup>9</sup> *Tweet* published by Marco Cortella on his *Twitter* profile on 22/01/2022. Source: <https://twitter.com/Mcx83/status/1484870790734651393>

<sup>10</sup> *Tweet* published by Lorenzo Ruffino on his *Twitter* profile on 22/01/2022. Source: [https://twitter.com/Ruffino\\_Lorenzo/status/1484861930225471493](https://twitter.com/Ruffino_Lorenzo/status/1484861930225471493)

<sup>11</sup> Source: <https://www.iltempo.it/attualita/2022/01/11/news/dati-sbagliati-robotto-speranza-mario-draghi-no-vax-vaccino-due-dosi-covid-errore-clamoroso-video-30061149/>



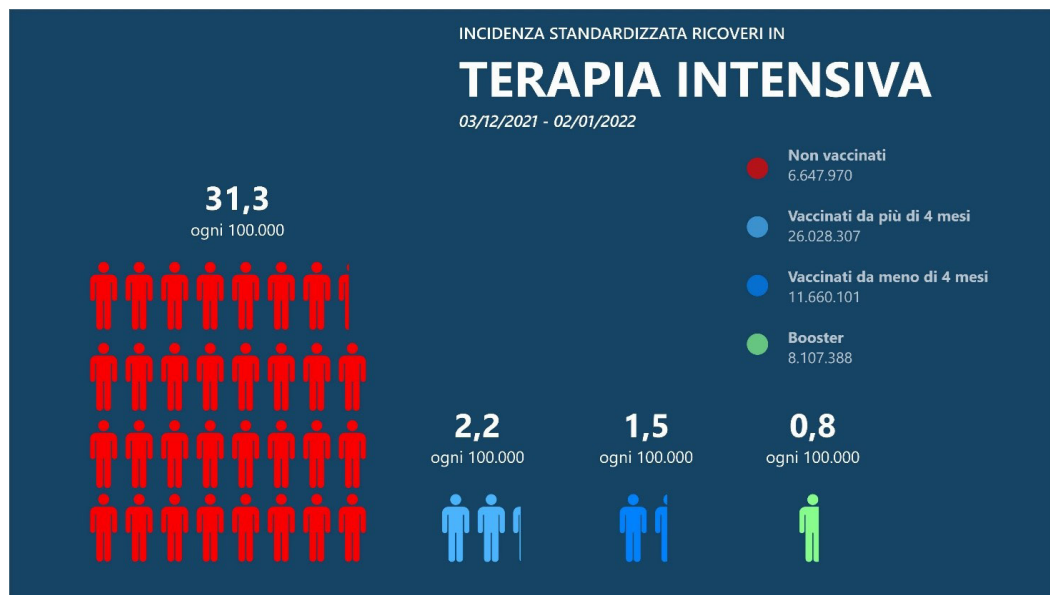


Figure 6. The standardised incidence of hospitalisations in ICUs over the time span indicated by the ISS.

Source: [https://twitter.com/Ruffino\\_Lorenzo/status/1484861930225471493](https://twitter.com/Ruffino_Lorenzo/status/1484861930225471493)

The criticism grew louder when, on 19 January 2023, an episode of the television *talk-show Non è l'arena* of the *La7* channel, utterly dedicated to the Covid situation, where the presenter, Massimo Giletti, dedicated the show opening and the first 25 minutes to the *Hope case* and the next 25 to the counting, interpretation, use, and instrumentalization of the Covid data. The program was aired in *prime time* and had a 5% audience share, reaching 866,000 viewers<sup>12</sup>. Addressing the *Hope case*, the presenter compared the incriminating chart (Fig. 2) with the corrected chart published the following day by the ISS (Figure 5), displaying them side by side (Figure 7), dwelling on the errors, and explaining the problems in detail. In scandalized tones, an exasperated Giletti condemned the incompetence of then Health Minister Speranza and the team who had created the graph, further accusing them of undermining the Italian government's reputation and credibility at a time when the health emergency was still delicate, which could have created a situation of solid political instability:<sup>13</sup>

So, I say to myself: but when you go on Fabio Fazio, Speranza, no, let me ask you the question: But between the Health Institute and the Ministry of Health do you talk to each other, Speranza? Because it is unbelievable that your peo-

<sup>12</sup> *Auditel* data of 19/01/2022. Source: <https://www.auditel.it/dati/>

<sup>13</sup> It should be remembered that the Draghi government, given the large majority that had supported it, corresponding to almost the entirety of the parliamentary hemicycle, and given the particular historical period in which it was born, had assumed the characteristics of a government of national unity, with the task of leading Italy out of the health emergency and planning projects to spend the PNRR (*National Recovery and Resilience Plan*) money from the European Union.

ple, Speranza, the people who are close to you, have exposed Draghi to such a shame—he makes a broad gesture with his arm and hand to indicate the two graphs projected on the giant screens behind him. Because, in the end, credibility is also in the correctness of the things one says. But how do you go to such an important, decisive press conference, giving old data, old, because they were from 12 December 2021, while as you see those of the Istituto Superiore di Sanità are obliged to report them on 26 December 2021, so they had the data widely available. This thing here raises a thousand things: if, or, I don't know, you don't have a good graphic designer, call Tommaso Cerno—*present in the studio* - who was the editor of *l'Espresso* for years and that *l'Espresso* used to make extraordinarily intense, beautiful covers, right? Here—*again he makes a broad gesture with his arm and hand to indicate the two graphic designers projected on the giant screens behind him* - someone has made a mistake!

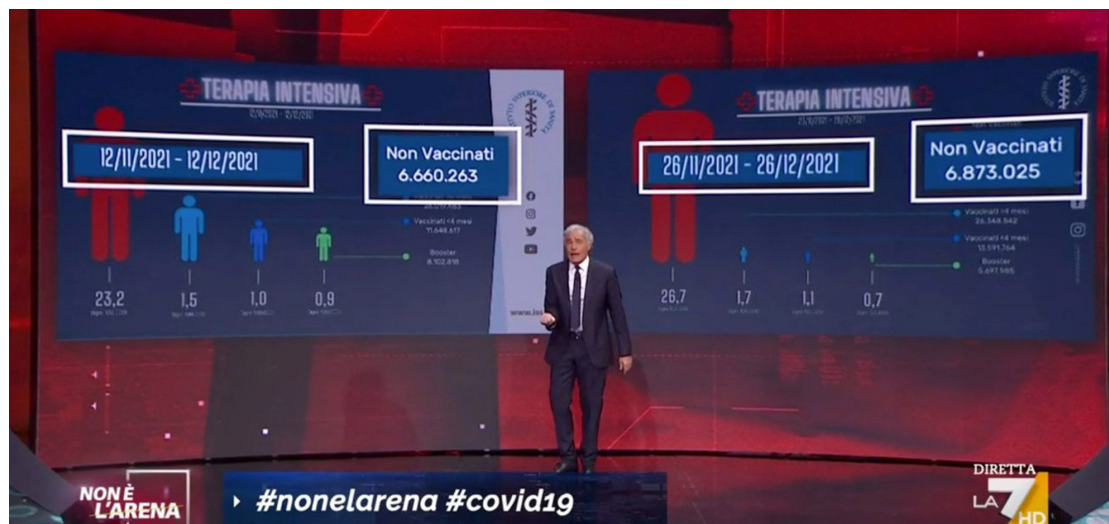


Figure 7. The presenter, Massimo Giletti, compared the two charts displaying them side by side.

Source: <https://www.ilsussidiario.net/news/speranza-errori-nel-grafico-su-ricoveri-in-ti-video-giletti-quando-va-da-fazio/2280495/>

After Giletti's broadcast, the story was once more in the press, particularly the right-wing newspapers: on 19 January, *il Tempo* headlined: "Non è l'arena, Massimo Giletti nails minister Speranza with the tragic graph full of errors"<sup>14</sup>; *il Giornale*, on 20 January headlined: "These data do not add up. Giletti nails Speranza live. The host of *Non è l'arena* compared the Health Minister's data with those of the ISS: here is what does not add up"<sup>15</sup>; *Business.it*, the same day proclaimed, "Giletti accuses Speranza: gross errors in press confer-

<sup>14</sup> Source: <https://www.iltempo.it/attualita/2022/01/19/news/non-e-larena-massimo-giletti-inchioda-ministro-speranza-tragico-grafico-errori-30160328/>

<sup>15</sup> Source: <https://www.ilgiornale.it/news/cronache/questi-dati-non-tornano-giletti-inchioda-speranza-diretta-2003645.html>

ence”<sup>16</sup>; also on 20 January, *ilSussidario.net* headlined: “Speranza, errors in the graph on admissions in intensive care / Video, Giletti: Quando va da Fazio...”<sup>17</sup>; *La Notizia* on 21 January headlined: ‘The Covid-Star gallery of horrors is lengthening. Newcomers are in the limelight, and new entries in TV brawls between experts are booming. Speranza’s slip presents data on vaccine efficacy with the wrong graph. The Health Minister Roberto Speranza has made another one. He presented data on the effectiveness of vaccines with the wrong graph’.

### FURTHER MISREPRESENTATIONS: THE SARDINIA AND LOMBARDY REGION CASES

These kinds of graphic errors, of *misrepresenting Covid data*, have certainly negatively affected the public’s perception of the credibility and reliability of the State institutions responsible for communicating Covid-19 information in Italy and beyond, as well as undermining the effectiveness of the prevention measures adopted. The *Hope case* really does appear to be a ‘mess’, as Nino Cartabellotta defined it<sup>18</sup>, who was called upon during the television program just mentioned to comment on the incident. We would add a mess that was well thought out, starting with the presentation of the data: during a press conference of the Presidency of the Council of Ministers, Minister Speranza displayed a sheet of paper showing it to the television cameras all over the country. When we speak of data visualization, as has already been said, the form and means by which data is presented are as important as the words that accompany it. Later, the mess materialized in Minister Speranza’s assertive tone and his choice of words while commenting on the *horrorchart*<sup>19</sup>.

The *Hope case*, unfortunately, was not isolated during the three years of the pandemic. Indeed, there have been many similar episodes in Italy and worldwide, and some are even trying to catalog (Doan, 2021; Engledowl & Weiland, 2021; Mooney & Juhász, 2020). Here, we briefly mention two other cases that have several similarities with the *Hope case*: the *Sardinia Case* and the *Lombardy Case*.

<sup>16</sup> Source: <https://www.business.it/massimo-giletti-accusa-il-ministro-speranza/>

<sup>17</sup> Source: <https://www.ilsussidiario.net/news/speranza-errori-nel-grafico-su-ricoveri-in-ti-video-giletti-quando-va-da-fazio/2280495/>

<sup>18</sup> Cartabellotta is a physician and President of the GIMBE Foundation (Italian Group for Evidence-Based Medicine), which was created in 1996, inspired by similar international initiatives adopting EBM (Evidence-Based Medicine).

<sup>19</sup> A group of *data visualisation* experts, precisely because of the many cases of *misrepresenting Covid-19 data*, have launched a *hashtag* on *Twitter*, *#Horrorchart* (terrifying, horrifying graph), to aggregate reports of misleading, manipulative or simply poorly designed graphs.

## SARDINIA REGION CASE

On 23 April 2020<sup>20</sup>, the *Sardiniapost* headlined, ‘Coronavirus, the bungling reports: wrong data and graphs from the Region’. The use of the term ‘bungling’ and its derivatives, which perfectly renders the sense of what happened, returns here. In this case, apart from the proven accusation against the Region of Sardinia of often having incorrect data and their display during communications on COVID-19, errors are denounced in the display of data in a report on pandemic data promoted by the Region of Sardinia and the Civil Protection<sup>21</sup>. As many as seven pie charts can be seen in the report, and the total is also graphically represented. Therefore, two halves can be seen because one is obviously the sum of the parts of the other. Another local newspaper reports the reflections of a young graduate in *Data Science* at the University of Cagliari, Michela Didu, who laments:

Today is a sad day for me. An ordinary citizen might not even notice the errors made by the report’s author, but to an average citizen who is experienced or at least a little more observant, these errors cannot escape notice. The errors made are partly errors of carelessness (see spelling mistakes), but above all they are errors of incompetence, in the sense that the person or persons who drew up this document have no idea what the principles and basics of statistics are that are necessary and indispensable for any analysis. In statistics, for example, a pie chart is a circle divided into sectors that each represent a proportion of the whole. Therefore, putting the total within the pie in the form of a slice is totally wrong as the total itself is already the whole - the whole pie - and cannot, therefore be a slice; obvious, no? The risk is to pass on information that is wrong or misleading, which is then read by the public who then draw wrong conclusions and pass on false information. Hence, a chain reaction that we are all familiar with<sup>22</sup>.

## LOMBARDY REGION CASE

From the beginning, Lombardy was not only the epicenter of the pandemic but also the scandals related to its healthcare, which came to the forefront the more the health emergency went on. The protagonists throughout the pandemic period were the president of

<sup>20</sup> Carta, A., 2020, Coronavirus, the reports of the bunglers: wrong data and graphs from the Region,

<sup>23</sup> April, *Sardiniapost*. Source: <https://www.sardiniapost.it/politica/coronavirus-i-report-dei-pasticcioni-dalla-regione-dati-e-grafici-sbagliati/>

<sup>21</sup> Region of Sardinia, Civil Protection, 2020, Covid-19: the response of the Region of Sardinia. Personal protective equipment, April. Source: [http://www.regione.sardegna.it/documenti/1\\_82\\_20200417194141.pdf](http://www.regione.sardegna.it/documenti/1_82_20200417194141.pdf)

<sup>22</sup> Editorial *Cagliaripad*, Covid, Region publishes erroneous reports. New graduate: ‘We are expert data scientists, but for you we don’t even exist’, *Cagliaripad*, 23 April 2020. Source: <https://www.cagliaripad.it/456478/covid-regione-pubblica-report-errati-neolaureata-noi-esperti-in-data-scientist-ma-per-voi-nemmeno-esistiamo/>

the Lombardy region, the lawyer Attilio Fontana, and the regional councilor and welfare councilor Giulio Gallera, also a lawyer. The two made joint live broadcasts on the region's website, during which the daily bulletin of the Covid situation was read out and Gallera presented the main data on the spread of the virus in person. However, their daily sorties were characterized by a series of inconsistencies, inaccuracies, and completely arbitrary and personal interpretations that provoked various criticisms from experts and the media<sup>23</sup>. We will refer to one of the many episodes consistent with our analysis. On 22 January, CICAP<sup>24</sup> published on its social profiles a post<sup>25</sup> entitled '*Beware of visual manipulations and misleading graphics*', which read:

Graphical representations are very useful in making the understanding of data easier and more immediate, even for the less experienced. However, it is sufficient to set up a graph with slightly different characteristics to those we are used to in order to generate a different perception of a phenomenon. A concrete example. The Lombardy Region has created a bar graph to represent the Rt of the different Italian regions. What stands out most is that the bars do not start from zero, but from an unspecified value close to 0.7. The use of truncated bar graphs is not recommended because it creates the visual illusion that there is a larger gap between the data than there really is, even if the numbers shown are correct. For example, looking at the graph the Molise figure would appear to be about twenty-five times larger than that of Campania, but looking at the numbers it is not even twice as large: 1.38 and 0.76 respectively. A less obvious manipulation concerns the scale with which the graph was constructed, which is also unfortunately not specified. Let us look for example at the bars for Sicily, Basilicata and Apulia: it would seem that the difference between Sicily and Basilicata and between Basilicata and Apulia is roughly the same. Yet, looking at the numbers, the former is almost four times the latter: 0.15 (1.27-1.12) versus 0.04 (1.12-1.08). If you want, you can try your hand at finding other incorrect proportions between the various bars. The end result is misleading because the differences between the regional Rt's are amplified. This does not mean that the data used for the graph is wrong: it is the choice to present it in this way that creates a distorted perception. To clarify further, we have produced a graph from the same data, untruncated and maintaining the correct proportions. As is evident, the differences between the various regions are no longer so large. Once again, we want to emphasize the importance of bringing the data into the public debate in

<sup>23</sup> How the complicated affair of the wrong data from Lombardy went, *The Post*, 25 January 2021. Source: <https://www.ilpost.it/2021/01/25/lombardia-area-rossa-errore-spiegazione/>

<sup>24</sup> *Italian Committee for the Control of Pseudoscientific Claims* founded in 1989 on the initiative of Piero Angela.

<sup>25</sup> The post can be consulted on CICAP's social profiles. As an indication, here is the link to the Facebook profile. Fonte: <https://www.facebook.com/cicap.org/photos/a.125553984194/10158166182214195/?type=3>



a clear, transparent, and accessible way for all.

The Lombardy Region's error of a methodological nature is clear, which can be attributed to a lack of *data literacy* and bad faith in the first place. To some commentators, however, the error of CICAP itself also became apparent<sup>26</sup>. The next day, there was an immediate correction by CICAP, admitting the oversight and publishing the following comment on the previous post:

Some comments have pointed out to us that  $R_t$  is a multiplicative and not an additive quantity; therefore, there is no particular reason to report it on a linear scale graph with an axis starting from zero, whereas it would be more appropriate to refer to a logarithmic scale graph. We thank the readers who pointed out the error and apologize for yesterday's incorrect post.

## DISCUSSION

After a detailed analysis of the cases, we delve into our research's key findings and implications, focusing on these three distinct cases that provide valuable insights into the complexities of data visualization during a public health crisis.

### *The Hope Case: Implications and contributions to research goals*

Minister Speranza's communication strategy, as observed in the *Hope case*, exemplifies the power of storytelling and data visualization in shaping public perception. His presentation of scientific data emphasized the importance of social distancing measures, testing capacity, and vaccination campaigns, using accessible language and visual aids to convey the message effectively. The case highlights the role of data visualization in making complex data understandable to the broader audience, especially when a non-expert like Speranza is tasked with communicating scientific information.

However, the *Hope case* also exposes the pitfalls of data visualization. The graph displayed during the press conference (Figure 1) contained inconsistencies and errors, inadvertently misleading the public. The graphical errors in the chart presented (Figure 1) by Minister Speranza underscore the importance of maintaining data accuracy and consistency in visual representations. The case demonstrates the potential consequences of inaccuracies and misinterpretations in data visualizations. When not properly designed, visualizations can distort the perception of data, leading to incorrect conclusions and, at times, public skepticism (Eyal, 2019; Fuller, 2018; McIntyre, 2018; Nichols, 2017). These findings emphasize the significance of adhering to best practices in data visualization to maintain credibility and trust in public health information. The *Hope Case* illustrates

<sup>26</sup> Pili, J., 2021, 'Misleading' graphs of the Lombardy region on RT indices of regions? *Open*, 24 January. Source: <https://www.open.online/2021/01/24/coronavirus-lombardia-grafici-ingannevoli-comita-to-piero-angela/>

the concept of emotional contagion (Herrando & Constantinides, 2021; Goldenberg & Gross, 2020; Hatfield et al., 1993) in communication. The errors in the chart led to widespread social media reactions, which, in turn, influenced the larger public discourse through the mainstream media. This case serves as a prime example of how issues related to data presentation can trigger emotional responses and impact public trust in government institutions.

### *The comparative analysis of the Sardinia and Lombardy Region cases*

While the *Hope Case* provides valuable insights into data visualization and institutional communication, the *Sardinia Region* and *Lombardy Region Cases* further enhance our research by offering comparative perspectives. These cases share similarities with the *Hope Case*, as they involve inaccuracies and misrepresentations in presenting COVID-19 data. They underscore the widespread nature of these issues in public health communication during the pandemic.

Like the *Hope Case*, the *Sardinia Case* highlights errors in the display of data, emphasizing the significance of presenting accurate and transparent information to avoid misinformation and false conclusions. The *Lombardy Case* presents a different type of error involving graphical representation, showcasing the importance of proper scale and visualization methods in conveying data.

### *Insights gained and future suggestions*

We see, therefore how in the *Hope, Sardinia and Lombardy Cases*, all the characteristics of the *misrepresentation* of the data on Covid-19 can be found: firstly, the quite blatant expression of the ignorance and incompetence of the politician, who from their privileged position believes they can act out and impose their narrative even when they do not have command of the important issues on the agenda; second, the explicit and blind trust that the career politician places in their advisors and technicians, often vastly overestimating these people's competencies; thirdly, the inexperience of advisors and technicians themselves, who, despite perhaps knowing their own limitations, venture into complicated and compromising (for them) situations, believing they can get away with it in front of a client (be it a politician, figure of authority, or institution) and a public (the citizens/spectators/users/consumers) whom they consider to be profoundly ignorant, or at the very least far less knowledgeable than themselves and, for that very reason, 'gullible'.

All three case studies presented here show how institutional communication during the pandemic was ineffective and prone to errors, particularly in the narration of the data. It is helpful to classify the types of mistakes made in institutional communication.

Firstly, **the error of inconsistency in the data narrative** can be identified. This error occurs when there are discrepancies between the data provided by the health authorities and those provided by the media. For example, suppose the health authorities state that the number of positive cases is decreasing, but the media report an increase in favorable

cases. In that case, this creates uncertainty in the population that can lead to the dissemination of incorrect information.

Secondly, **the error of incompleteness in the data narrative** occurs when health authorities do not provide all available data on the pandemic. For example, suppose data on the virus variants present in the territory are not provided. In that case, the population may not be fully informed, leading to misunderstandings and misinformation.

Thirdly, **ambiguity in the data narrative** occurs when health authorities use vague and imprecise language when communicating data. For example, suppose health authorities claim the situation is under control without providing precise data on the number of positive cases or infection rates. In that case, the population may have difficulty understanding the problem, leading to a lack of risk awareness.

Finally, **the error of oversimplification in the data narrative** occurs when health authorities oversimplify data to try to make it more understandable to the population. This error can lead to the loss of important information on the pandemic and create a false perception of the situation.

In contrast to the *Hope Case*, the *Lombardy Case* introduces unique lessons that are invaluable for shaping future communication strategies. These cases underscore the necessity of carefully considering the scale and data visualization techniques in conveying data (Crisan, 2022; Dasgupta & Kapadia, 2022). Ensuring that visual representations accurately represent the data is essential to prevent public misunderstanding and skepticism. Additionally, the broader implications of these cases emphasize the pressing need for improving data literacy and the accuracy of data presentation. As we move forward in managing public health crises, spokespeople must be more careful in the interpretation of data and prioritize transparency and rigor in data visualization (Kessler & Bachmann, 2022). This will foster public trust and empower individuals to make informed decisions, thereby bolstering collective efforts to combat the challenges presented by pandemics and other health crises (Haldane et al., 2021).

## CONCLUSION

These cases help us understand the broader challenges and pitfalls of data narrative and institutional communication during the COVID-19 pandemic in Italy. The COVID-19 pandemic highlighted the importance of institutional communication in managing a national and global health crisis. However, institutional communication during the pandemic was sometimes ineffective and prone to errors and confusion, particularly in data narration through *data visualization* tools.

We can speculate that the errors documented in these cases occurred for multiple reasons. Fundamental human error may account for some of them, given that the people responsible for preparing communications would likely often have been working under

high pressure in stressful circumstances that involved tight deadlines and vast volumes of data amidst a rapidly changing public health emergency. A general or systemic lack of rigor in checking the data is another possible and related explanation, for instance, in the use of 'old' data in the *Hope case*. The same might be said for what must be considered very basic data visualization gaffes, such as the presentation of totals within pie chart segments in the Sardinia case.

It is also likely, however, that politicians and their assistants' lack of data literacy contributed to errors. While using totals within pie charts is an error that many schoolchildren would probably identify, the distorting effects of pictograms with the wrong proportions or the correct representation of multiplicative  $R_t$  values arguably require higher training and familiarity with statistics and data visualization tools.

Regardless of the reasons behind the errors, they should not be excused, and the issue's significance should not be understated. On the one hand, it would be wrong, based on the evidence of these cases, to conclude that institutional communications in Italy were actively seeking to misrepresent data for political ends or to create a false narrative. We have seen that Health Minister Speranza's promotion of mass vaccination, for example, would have been undermined by the data visualization errors in his faulty infographic. On the other hand, the public's right to accurate information during a health crisis is vitally important. Official communications must compete with massive volumes of fake news circulating on social media. When politicians and other institutions misrepresent data, they are letting the public down; they are exacerbating the infodemic phenomenon and thus making their jobs much harder. The public reaction in the *Hope case* focused on the perceived ineptitude of the individuals and institutions responsible, sometimes justifiably the target of ridicule. However, the issue has a serious side, and the errors surely erode trust and credibility. These errors could quite quickly have gone the other way, i.e., by mistakenly overstating vaccinations' efficacy and impact on intensive care admissions. The criticisms would undoubtedly have become more sinister and accusatory in that alternative scenario. Given the existing intense public controversy over mass vaccination campaigns, one can only imagine the levels of furor among anti-vax groups and conspiracy theorists that would have ensued had these errors been perceived as deliberate attempts to mislead.

Identifying the main types of errors in data narration can help health authorities improve processes of institutional communication and provide clear and accurate information to the population, thus reducing the risk of misinformation and its subsequent dissemination. Therefore, data must be presented correctly and transparently, avoiding instrumentalizations and distortions of reality that could compromise communication.

The analysis of the *Hope*, *Sardinia Region*, and *Lombardy Region cases* serves as a cautionary tale, emphasizing the importance of accurate and transparent communication to maintain public trust and effectively combat the pandemic. The paper's conclusions need

to be further refined to provide a deeper sociological understanding of the role of data visualization within the public communication of science and governance processes. In the realm of institutional communication during the COVID-19 pandemic, errors and inconsistencies in data narration have been observed, potentially leading to public confusion and misinformation. As Resnik (2015, 2008) aptly puts it, “many of the errors and prejudices against science stem precisely from the misrepresentation, mystification, and distortion of data.” This highlights the need for a more comprehensive exploration of the social and political consequences of these communicative “errors” and their theoretical interpretations. The impact of such events at the systemic level and their theoretical interpretations should be more deeply investigated, especially concerning their relationship with the crisis of expertise and the post-truth challenge.

The Covid-19 pandemic has underscored the critical role of institutional communication in managing a health crisis. Health authorities must address these data narrative errors, offering the population clear, accurate, and transparent information. This paper aims to contribute to cultivating an epistemic horizon that aligns with the social sciences’ role in both standards and emergencies. To address issues of misrepresentation, mystification, and distortion of data, the development of robust civic engagement and the fostering of a mature ‘civic culture’ is crucial.

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