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# DISRUPTION IN THE COMMUNICATIVE MODEL OF EXPERT SOURCES: THE IMPACT OF COVID-19 ON BOTH CULTURAL-SCIENTIFIC AND INNOVATION UNITS

# DISRUPCIONES EN EL MODELO COMUNICATIVO DE LAS FUENTES EXPERTAS: IMPACTO DEL COVID-19 EN LAS UNIDADES DE CULTURA CIENTÍFICA E INNOVACIÓN

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## ABSTRACT

The impact of COVID-19 during the state of alarm on the cultural-scientific and the innovation units that form part of the network Fundación Española para la Ciencia y la Tecnología [Spanish Foundation for Science and Technology] is analyzed in this paper. In a context marked by the «infodemic», the role of the Foundation as a source of expert opinion, the lessons learned, and the opportunities for improvement that all crisis-related processes entail, as well as tools, routines, and information management methods are all scrutinized. This investigation applies both quantitative and qualitative perspectives and includes semi-structured questionnaires directed at those in charge of the aforementioned units (n=24 of 104) and in-depth interviews with authors qualified in the dissemination of science who, in turn, appear in the Whitebook of these units (n=5 of 9). The study highlights that the pandemic occasioned disruptions in the

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model of communication and dissemination as some of its actions were not able to be carried out in person. The need to heighten their relevance as sources of expert opinion, and to organize greater coordination, to optimize the efficacy of this network against disinformation. In addition, the paper focuses on the challenges that these units must face in the future to implement the objective for which they were created.

**KEYWORDS:** Covid-19 – cultural scientific and innovation units – crisis communication – infodemic – scientific communication – scientific dissemination – specialized journalism.

## RESUMEN

Se analiza el impacto del Covid-19 en las unidades de cultura científica y de la innovación, integradas en red de la Fundación Española para la Ciencia y la Tecnología, durante el estado de alarma. En un contexto marcado por la «infodemia», se indaga en su papel como fuentes expertas, en las lecciones aprendidas y en las oportunidades de mejora que toda crisis comporta en los procesos, herramientas, rutinas o métodos de gestión de la información. La investigación aúna las perspectivas cuantitativa y cualitativa, e incluye cuestionarios semiestructurados dirigidos a los responsables de las mencionadas unidades (n=24 de 104) y entrevistas en profundidad a cualificados divulgadores en ciencia y autores, a su vez, del Libro Blanco de estos departamentos (n=5 de 9). El estudio pone de relieve que la pandemia ocasionó disrupciones en su modelo de comunicación y divulgación al no poder realizar algunas de sus acciones de forma presencial, la necesidad de acrecentar su relevancia como fuentes expertas, y la conveniencia de articular una mayor coordinación para optimizar la eficacia de esta red contra la desinformación. Además, abunda en los retos que deben afrontar en el futuro estas unidades para implementar el objetivo para el que fueron creadas.

**PALABRAS CLAVE:** Covid-19 – unidades de cultura científica y de la innovación – comunicación de crisis – comunicación científica – divulgación científica – infodemia - periodismo especializado.

# DISRUPÇÕES NO MODELO COMUNICATIVO DAS FONTES DE ESPECIALISTAS: IMPACTO DO COVID-19 NAS UNIDADES DE CULTURA CIENTÍFICA E INOVAÇAO

## RESUMO

Se analisa o impacto da Covid nas unidades de cultura científica e inovação, integradas na rede da fundação espanhola para a ciência e a tecnologia, durante o estado de alarme. Em um contexto marcado pela <<infodemia>>, nos perguntamos a função dos especialistas, nas lições aprendidas e nas oportunidades de melhora que toda crise tem nos processos, ferramentas, rotinas ou métodos de gestão da informação. A pesquisa inclui também as perspectivas quantitativa e qualitativa e inclui questionários semi estruturados dirigidos aos responsáveis das unidades antes mencionadas. (n=24 de 104) e entrevistas aprofundadas feitas com divulgadores qualificados especialistas

em ciência e autores, e ao mesmo tempo ao livro branco destes departamentos (n=5 de 9). O estudo mostra que a pandemia causou disrupções no seu modelo de comunicação e divulgação, devido a que não podia ser feito de forma presencial, e a facilidade de articular uma maior coordenação para otimizar a eficácia desta rede contra a desinformação. Além disso, sobram os desafios que devem se enfrentar no futuro nestas unidades para implementar o objetivo com o que as mesmas foram criadas.

**PALAVRAS CHAVE:** Covid-19 – unidades de cultura científica e da inovação – comunicação de crise – comunicação científica – divulgação científica – infomedia - jornalismo especializado.

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

## 1. INTRODUCTION

The Covid-19 pandemic is forcing us to rethink the future. It has had a special impact on the scientific machinery, exposed to the public with overwhelming omnipresence (Revuelta, 2020). The scientific community has never been watched with such expectation. We are witnessing the accelerated formation of a new ecosystem of science where national borders are dissolved, expert review processes are accelerated, data is shared, scientific communication models are innovated, and the wealth of knowledge produced by the international scientific community is made accessible in weeks (Lafuente and Giménez-Toledo, 2020).

In the post-covid era, it is worth wondering about its impact on one of the most important agents of the dissemination of science and technology in Spain: the scientific culture and innovation units, 104 in total, that make up the UCC+i network of the Spanish Foundation for Science and Technology (FECYT, 2016), dependent on the Ministry of Science and Innovation. Attached to universities, research centers, or museums, their objective is to improve training, scientific knowledge, and knowledge transfer (FECYT, 2012). They are intermediaries between researchers and journalists, collaborate with the media in the development of content, and are at the service of scientists to advise them on the communication of their projects and results. Furthermore, they manage the intervention of the research web in current scientific issues and help shape public opinion.

Their purposes are set out in Law 14/2011, of June 1st, on Science, Technology, and Innovation, which attributes to public administrations the duty of promoting "society's access to science." Despite their boom in the last decade, especially with the declaration of 2007 as the Year of Science, the truth is that this commitment to science and technology is incipient and suffers from a certain delay, not only in Spain but in all Europe. In the American continent (Pérez-Rodríguez, 2016) there have been actions for almost a century. Among the pioneers, the creation in 1920 of the Science New Service news agency. In Spain, the first news agency specialized in science, of a

national and public nature, was born in February 2008. It is the SINC agency, dependent on the FECYT (Barberá-Forcadell, 2014).

Doing science is an exciting task and communicating it is part of this experience (Lázaro, 2020). In the approaches to dealing with the relationship between science and society, terms such as scientific literacy –knowledge that society has about the scientific method–, public understanding of science, or the current public engagement in science participation –the dialogue between scientists and society (public engagement)–, where the media and the digital sphere (López-Pérez and Olvera-Lobo, 2019) play a crucial role, have been used. As Ferrer and León (2008) indicate, when it comes to approaching knowledge, what is important is the understanding of science and technology.

Scientific journalism makes a gigantic instructional effort with the objective, as expressed by Mayor Zaragoza, of "avoiding the state of informed ignorance" (Calvo-Hernando, 2002, p. 489). Science is "a collective adventure" (Alcalde, 2018), where each advance is the work of many people, including those who transfer the results to society.

Brossard (2014) has highlighted that important North American scientific disseminators have moved from the mainstream media to blogs or Twitter. A cultural change in communication is taking place, especially among young scientists, who tend to communicate directly with the non-specialized public. Cassany et al. (2017) define the science journalist as "one of the main responsible in the chain of transmission and interpretation of all news, novelty, or advance of a scientific nature towards society" (p. 9). Calvo-Hernando (1977) spoke of this specialty as the great challenge of the 21st century, and Revuelta-De la Poza (2019) refers to the "evolution and revolution" generated by Information and Communication Technologies in journalism. However, the road is long (Elías, 2008). There is still suspicion (Cañellas, 2012) on the part of the scientist, who prefers to use the network to communicate directly with the citizen. Indeed, experts have begun to blog and tweet their findings, but this should occur when they learn to do so (Brossard, 2014), and there the role of the science journalist is fundamental, narrowing the abyss that has always separated researchers from citizens (Pérez-Curiel, 2005).

Society increasingly uses traditional media and the Internet to find out about diseases, treatments, and healthy lifestyles (Catalán-Matamoros, 2015). On the Internet, the expert and non-expert voice often have the same weight, which leads to poor communication health (De Semir, 2015), "infoxication", and liquid information (Benito-Ruiz, 2009).

### 1.1. A context marked by misinformation

On January 30th, 2020, the World Health Organization (WHO) declared the outbreak of the new coronavirus SARS-CoV-2 a public health emergency. Given its rapid expansion, it was classified as a pandemic on March 11th. To guarantee the containment of the disease caused by the virus, Covid-19, the Government of Spain

established the state of alarm through Royal Decree 463/2020, of March 14th. That day, Spain accumulated 5,753 confirmed cases and 136 people had already died. It was the fifth country in the number of cases worldwide and the second in Europe, behind Italy.

After the proclamation of the state of alarm –in effect until June 21st, 2020– and the subsequent confinement of the population, 78% of the public got informed more than before the pandemic (Masip et al., 2020) and the published news tripled, the majority in the digital press (Lázaro-Rodríguez and Herrera-Viedma, 2020). It has been found that the consumption of traditional media, such as television, increased, or that interest in news in audiences that had moved away from them returned (Casero-Ripollés, 2020).

As the new coronavirus spread, the false information virus spread. The Secretary-General of the United Nations, António Guterres, after recognizing the danger of this "infodemic", warned that "the enemy is also the growing increase in misinformation" and that, in the face of this pandemic, "the best possible vaccine is science and solidarity" (United Nations, 2020). UNESCO released several reports on World Press Freedom Day that showed how the massive spread of rumors was creating confusion and mistrust. It declared that journalism is key to providing reliable information because it helps citizens to keep abreast of "the evolution of science about the virus, to learn about its prevention and treatment, and to know the approved political measures" (UNESCO, 2020). Fernando de Yarza, president of Wan-Ifra (2020), World Association of News Editors, called for responsibility in the face of the "greatest journalistic challenge" of the last 100 years: "Journalism is, above all, a vital public service of first necessity […] we have an inexcusable duty to guarantee citizens the right to know the truth. Nothing more. Truth and clarity about what is happening".

This old key of the profession –verification, corroboration– is essential to regain the trust of society (Mayoral et al., 2017). Disinformation and self-serving lies have always existed, although what is new today is their rapid and massive dissemination (Vosoughi et al., 2018). The United Nations Special Rapporteur, David Kaye (2020), has expressed his concern that the virus itself emerged in environments of censorship, growing repression of dissent, politicization, and denigration of experience and science: "Lies and propaganda deprive individuals of autonomy, the ability to think critically, to trust themselves, and information sources". The European Union pointed to "Russia and China as instigators of disinformation campaigns amid the pandemic" (Sánchez, 2020), hence it has recommended immediate denials, the closure of accounts on social networks, and the work of verifiers and media.

In this multiplication of misinformation (Franco and Gértrudix, 2015), fake news (Tandoc et al., 2018) has captured the attention of experts. For some, the term is misleading, as it constitutes "an unacceptable oxymoron" (Mayoral et al., 2017, p. 398). If it is fake, it is not news. And if it is news, and therefore has been verified, it is not fake. Salaverría et al. (2020, p. 12) consider that "hoax" offers a broader meaning: "All content that is intentionally false and of true appearance conceived to deceive citizens, and publicly disseminated by any platform or media". The study

carried out by Salaverría et al. (2020), which analyzed a sample of hoaxes disseminated during the first month of the state of alarm, determined that the majority (34.9%) referred to "Science and Health" issues, focused on the origin of the coronavirus.

## 1.2. The experts during the pandemic

Journalists and health professionals share a symbiotic relationship during a disease outbreak (Lubens, 2015). Source journalism plays a fundamental role in health crises (López-García, 2020) because it tests the ability of writing teams to provide the causes and consequences. The source is the origin of the news (Muñoz-Torres, 1994), determines the content of the media, and is associated with journalistic rigor and quality (Casals-Carro, 2005; Maciá-Barber, 2020). Berganza and Chaparro (2012) point out that specialized topics need a greater number of sources, and Ramírez de la Piscina et al. (2015) recommend taking care of both the selection processes (gatekeeping) and production of the news (newsmaking) as well as the social contribution that the event provides to society.

In the post-truth era (Cooke, 2017) a journalist is worth his agenda, to the extent that their sources are relevant, pertinent, and reliable. Disinformation strategies are imposed when journalists and citizens do not have verification mechanisms for each speech. Hence the importance of fact-checking to combat misinformation (Molina-Cañabate and Magallón-Rosa, 2020).

Within the classification of informative sources, those of the experts constitute the unofficial or alternative ones (Casero-Ripollés and López-Rabadán, 2012). In crisis communication, there is an excessive dependence on official sources (Sandman, 1997), although they do not always generate trust (González-Villariny, 2008; Ibáñez-Peiró, 2014). Its credibility (Peters et al., 1997) depends on factors such as the knowledge of experts (Saavedra-Llamas et al., 2019), hence Mayo-Cubero (2020) proposes that in the account of the crisis there is a balance between official and non-official sources, especially in the first phase, where the objective should be to save lives and minimize damage.

Days before the declaration of the state of alarm in Spain, the President of the Government, Pedro Sánchez, affirmed that the first thing he did to address the health dimension of the coronavirus was to make decisions based on "scientific criteria" (Secretary of State for Communication, March 10th, 2020). Three groups of experts were formed:

1. The Covid-19 technical-scientific committee, led by the head of the Center for the Coordination of Health Alerts and Emergencies, the epidemiologist Fernando Simón.
2. With the de-escalation –the exit from confinement and the return to normality–, a team was in charge of determining the territories that passed from one phase to another.

3. A committee of 100 experts, mostly economists, but also sociologists or scientists, responsible for redesigning the economy and society of the post-covid era.

Fernando Simón has been the most visible face of the pandemic in Spain. His daily presence to publicize the news of the pandemic has given him a relevant and iconic role (Lasexta.com, 2020). Like Simon, other experts – Angelo Borrelli, in Italy; Lothar Wieler, in Germany, or Jerome Salomon, in France– have gone from anonymity to popularity in just two months (Buj et al., 2020). Epidemiologists and virologists have become household names after spending most of their lives "in anonymity" (Stevis-Gridneff, 2020).

## 2. OBJECTIVES

The development of the theoretical framework has made it possible to delve into the characteristics of the communication process during the state of alarm and underline the importance acquired by expert sources, and specifically the UCC+i. This work focuses on researching the impact of Covid-19 on the mission of these departments, as well as researching the lessons learned and the opportunities for improvement that every crisis entails. We, therefore, seek to know their work during the state of alarm, from March 14th to June 21st, 2020. These are the research objectives:

O1. Analyze the organization and structure of the UCC+i.
O2. Examine the type of disclosure they developed about Covid-19.
O3. Detect if their relevance as expert sources increased and if they undertook coordinated actions.
O4. Study the strengths and weaknesses that conditioned their performance, as well as establish future improvements to optimize their results.

The hypotheses from which we start are the following:

H1. Information about Covid-19 monopolized their communication and they dedicated efforts to combat misinformation. Both circumstances suggest that their relevance as expert sources will be reinforced.
H2. The impact of the coronavirus caused the emergence of new digital strategies, which represented the greatest transformation experienced by these units in their scientific communication models, in the narrow margin of 14 weeks.

## 3. METHODOLOGY

If the method is built in a way that is closely linked to the intended objectives (Aróstegui, 2001), this research starts from secondary sources to delve into the state of the issue (Ramírez-Montoya and García-Peñalvo, 2018). To this theoretical part, an empirical one has been added with the use of a quantitative and qualitative perspective. Their combination allows for an in-depth content validity study because they complement each other by incorporating different views that converge in the same results (Berganza and Ruiz, 2005).

The fieldwork consisted of the distribution, through the FECYT, of a semi-structured questionnaire –divided into five parts with a total of 39 questions– addressed to those responsible for the 104 scientific culture and innovation units that make up the census of the UCC+i Network. The response rate obtained was 23% (n=24 of 104) (Table 1). The first block of the form focused on the idiosyncrasy of the UCC+i, the professional profile of their members –number, gender, age, academic qualifications, professional experience–, and their organizational dependence. The second section researched the actions carried out, both before the declaration of the state of alarm and during this period: informative tasks, periodization, priorities, degree of difficulty in carrying them out, type of disclosure that they practiced about Covid -19, if they had a crisis communication plan, or if they undertook coordinated actions. Specifying the measures taken to disprove hoaxes was the objective of the third module, which considered questions regarding whether they disseminated messages to reinforce those issued by scientific organizations or about the type of falsehoods that they refuted about the virus: if they were related to scientific issues, with recommendations about health or health management. In the same way, it was intended to find out if the fact-checking platforms went to these departments to verify the information. The fourth section checked the perception that the UCC+i deserved of their role as an information source: their position of relevance before and after the state of alarm was assessed, the communication flows that occurred when providing content were defined, and the journalistic genres, media supports where they were collected, who starred in them, the areas of knowledge that stood out, and the degree of satisfaction obtained with the task carried out were identified. In the last block, the responses on the weaknesses and strengths that were manifested were grouped, as well as the improvement proposals for the future.

The Likert scale –where 1 corresponded to the lowest score and 5 to the highest– was used to measure attitudes and determine the degree of agreement with the proposed statements. It is useful in this work, which intends for the respondents to qualify their opinion and capture the intensity of their feelings. Once the process is finished, each variable and parameter are analyzed individually and together to obtain a total value (Blanco, 2014).

***Table 1.*** *Sample of scientific culture and innovation units*

| Autonomous Community | Location | Type of organism |
|---|---|---|
| Andalusia | Seville | University |
| Aragon | Zaragoza | Research Institute |
| Cantabria | Santander | University |
| Castilla y León | Burgos | Research Center |
| | Burgos | University |
| | Salamanca | Foundation |
| Castilla-La Mancha | Albacete | University |
| Catalonia | Lleida | Research Institute |
| | L' Hospitalet Llobregat | Research Institute |
| | Tarragona | University |
| | Cerdanyola del Vallès | University |
| Valencian Community | Castellón de la Plana | University |
| | Elche | University |
| | Valencia | CSIC |
| Extremadura | Badajoz | University |
| Galicia | Vigo | University |
| Madrid | Getafe | University |
| | Madrid | University |
| | Madrid | University |
| | Madrid | Oceanography Institute |
| | Móstoles | University |
| Murcia | Murcia | University |
| Navarra | Pamplona | Science Museum |
| La Rioja | Logroño | University |
| | | Sample: 24 UCC+i (23%) |
| | | Total sample: 104 UCC+i (100%) |

**Source:** Self-made

Furthermore, in-depth interviews were conducted with the experts in scientific dissemination who wrote the UCC+i Whitebook in 2012 (Table 2). The response rate was 55.5% (n=5 of 9). They delved into the "infodemic" situation that occurred during the state of alarm, in the hoaxes that circulated during this period, identifying the most worrying ones, and in the role played by the UCC+i as reliable sources of information in this context of disinformation. Likewise, they reflected on whether the resources of this network could have been better used to offer a more forceful response to falsehoods, if it had been pertinent to establish a joint communication strategy or a single address to, in a situation of a health crisis such as the experienced one, better position the messages of the experts. Lastly, they were asked about the changes or improvement actions that could be incorporated to optimize results in the post-covid era.

***Table 2.*** *Sample of experts in scientific culture and innovation units*

| Name | Title/Responsibility |
|---|---|
| Margarita Becerra García | Head of the UCC+i at the University of Barcelona |
| Bienvenido León Anguiano | Director of the Research Group on Science Communication at the University of Navarra |
| César López García | Head of the Unit for the Promotion of Scientific Culture and Innovation of the *FECYT* |
| Ana V. Pérez Rodríguez | Coordinator of the Ibero-American Agency for Scientific Information (DiCYT) at the University of Salamanca |
| Luis Zurano Conches | Coordinator of the Scientific Communication and Innovation Unit of the Polytechnic University of Valencia |
| Sample: 5 writers of the UCC+i *Whitebook* (55.5%)<br>Total sample: 9 writers of the UCC+i *Whitebook* (100%) | |

**Source:** Self-made.

Thus, the research has the opinion of recognized specialists on the object of study (Hernández-Sampieri and Mendoza-Torres, 2018). Likewise, and despite the response rate obtained (23%) in the semi-structured questionnaire, and the limitations that may arise regarding its representativeness, we believe that it is a sufficient number to reach the saturation point –moment from which the work can be considered complete, when the interviewees repeat what was said by the previous ones (Callejo-Gallego, 1998; Mucchielli, 1991)–. As proposed by Jansen (2012), the size is sufficient because it covers the relevant diversity in terms of the proposed objectives.

Both questionnaires were validated by five experts, whose selection was due to their academic training, professional experience, and recognition in the community, two of them being competent in measurement and evaluation. Expert judgment is a generalized practice (Escobar-Pérez and Cuervo-Martínez, 2008) that requires interpreting and applying its results correctly, efficiently, and with all methodological and statistical rigor, to allow the evaluation based on the information obtained from the test, to be used for the purposes for which it was designed.

## 4. DISCUSSION

The presentation of the results presented in this section includes four segments, in line with the objectives set by this research. In the course of the data, those obtained through the semi-structured questionnaires are interspersed with those derived from the in-depth interviews.

### 4.1. Idiosyncrasy of UCC+i

The management of the UCC+i are held by more women (54.2%) than men (45.8%), and their age is over 30 years old. They are concentrated in the range that goes from 41 to 50 years old (62.5%). 41.7% have been in office for less than 3 years, although 25% are more veteran, who assumed this responsibility more than 10 years ago. Precisely, six of the original UCC+i have participated in this study, such as the

Autonomous University of Madrid, founded in 2006, or the National Center for Research on Human Evolution (CENIEH) created in Burgos in 2008.

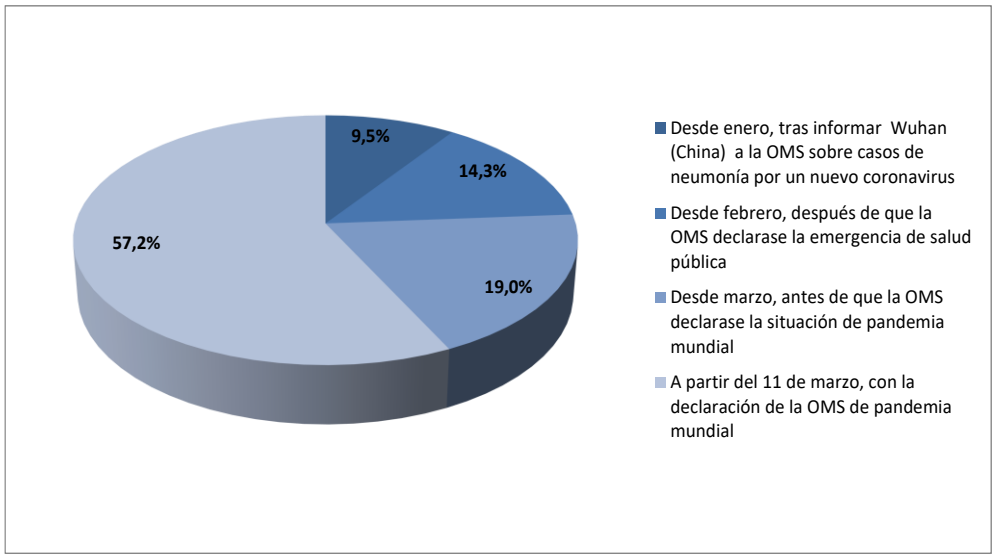
Their organization chart is very uneven. The casuistry ranges from those made up of a single person (8.3%) to others made up of 18 (4.1%). There are similarities in the formation of their members. The majority of those responsible are journalists and/or audiovisual communicators (60%), and when the director has another profile, such as a professor in physiology or a doctorate in biology, for example, it is usual for his team to be made up of two or three other experts in communication (58.3%). Most of the centers on which they depend have a crisis communication plan (37.5%), others do not have one (33.3%) or are unaware of it (29.2%).

In general, "they are small units, with little staff and budget, and with a high temporality", according to Marga Becerra, who is committed that they gain importance and be "closer to the rectorships and directorates, to perform an essential task". Luis Zurano thinks likewise, who sees it necessary to consolidate them in the organization charts of universities and research centers.

## 4.2. Disclosure characteristics

Before the declaration of the state of alarm, they focused their activity on one or more of these four fields: scientific dissemination (100%), communication of R+D+i results (95.8%), advice and training of researchers (70.8%), and research (25%). Due to the pandemic, the activity that has suffered the most has been scientific dissemination. All those responsible (100%) report difficulties in executing these initiatives due to confinement. This decrease affected less the tasks of training and advice (33%), communication of R+D+i results (16.7%), and research (12.5%).

During the state of alarm, 87.5% disclosed content about Covid-19, while the other 12.5% did not originate it. The majority (57.2%) provided information since March 11th when the WHO declared the global pandemic (Graph 1). 42.8% began the dissemination before that date: the earliest, since January (9.5%), after the cases of pneumonia in Wuhan as a result of a new coronavirus transcended (WHO, April 27th, 2020).




***Graph 1:*** *Date on which the UCC+i began to report on Covid-19*
**Source:** Self-made

Not all topics about the pandemic were of equal interest (Table 3). The R+D+i results prevailed, with "enough" or "a lot" of disclosure (50%). They were followed by scientific knowledge of the virus (37.5%) and the social, political, or economic consequences derived from the health crisis (33.4%). Other types of information (20.9%) and that of how to face and overcome confinement (20.8%) received less attention.

***Table 3.*** *Degree of dissemination of the coronavirus topics*

| Topics | None | Little | Moderately enough | Enough | A lot |
|---|---|---|---|---|---|
| Communication of R+D+i results | 16.8% | 4.1% | 29.1% | 25.0% | 25.0% |
| Information on scientific knowledge of the virus or disease | 20.9% | 25.0% | 16.6% | 25.0% | 12.5% |
| Information on how citizens must face and overcome confinement | 41.6% | 16.6% | 21.0% | 16.6% | 4.2% |
| Information on the social, political, economic, environmental, psychological (…) consequences | 29.1% | 12.5% | 25.0% | 20.9% | 12.5% |
| Other information | 41.6% | 12.5% | 25.0% | 8.4% | 12.5% |

**Source:** Self-made

They "strongly agree" that the generation of content was produced ex officio (58.3%), that their response to the media was agile (43.5%), and that the researchers met the demand generated by journalists (39.2%). Only 13.4% state that they "strongly agree" that the content information was produced at the request of the media. This assertion also accumulates the highest percentage of "strongly disagree", with 13.3% (Table 4).

***Table 4.*** *Opinion on communication flows*

| Communication flows | Strongly disagree | Disagree | Indifferent | Agree | Strongly agree |
|---|---|---|---|---|---|
| The disclosure of content has occurred ex officio | 4.2% | 4.2% | 16.6% | 16.6% | 58.3% |
| The dissemination of content has occurred at the request of the media | 13.3% | 17.3% | 30.0% | 26.0% | 13.4% |
| The dissemination of content has occurred with agility and has responded to the needs of immediacy required by the media. | 4.3% | 0.0% | 26.1% | 26.1% | 43.5% |
| Researchers have played an active role in promoting scientific information | 0.0% | 8.4% | 20.9% | 37.4% | 33.3% |
| Researchers have been available and responded to the demand generated by the media | 4.3% | 0.0% | 21.8% | 34.7% | 39.2% |

**Source:** Self-made

César López describes the informative work carried out as "excellent", especially taking into account "the external circumstances and pressure" of the moment. Ana Victoria Pérez agrees in this assessment: "they have acted quickly and have become facilitating agents".

Among the communication resources that they promoted, the press releases (91.6%) and social networks (87.5%) stood out. They also invested efforts in serving the media (54.2%) and implementing radio (29.2%), informative (29.1%), or television (25%) products, many of them suitable for mobile devices. A good part of these materials will go to educational centers. As Becerra explains, children and young people can be "the family prescribers" to impregnate adults with truthful and rigorous content.

## 4.3. Expert sources

The units have strengthened messages about the coronavirus to reinforce those issued by scientific organizations. 83.3% claim to have had an impact on them –25%, "enough" or "a lot"–, while 16.7% did not disclose them. A large majority think that their activity had "enough" repercussion in the media. This is expressed by 56.5%, and especially within their local and regional scope, followed by the national one, and, to a lesser extent, the international one. Their information appeared "very frequently" on social networks (79%) and in the digital press (75%). They are followed in importance by the paper press (37.5%), radio (33.3%), and television (25%).

The media collected "very frequently" their news events under the genre news (70.8%) and interview (29.1%). The opinion formats (20%) and reports (8.3%) had less repercussion. The protagonists of the journalistic texts were, "very frequently", researchers (87.5%), at a great distance from the research centers (3.3%) or from the organization (1.6%) to which they belong. They underline the media interest in an extensive and heterogeneous list of areas of knowledge: mathematics (experts in the expansion of epidemics), economics, environment, communication, biomedical engineering, molecular biology, computer engineering (data privacy), public health, pharmacology, intelligence artificial, aerosol physics, education, medicine, nursing, anthropology, geography, bioinformatics, psychology, psychiatry, tourism, etc.

The perception of those responsible for these units about their relevance as expert sources is positive, and it practically did not change during the state of alarm. Only two believe that it increased from "medium" to "high" and one that it worsened from "low" to "very low." The sum of the percentages of those who attribute a "medium" and "high" relevance, both before and during the state of alarm, is the same: 82.6%.

45.8% affirm that they "never" fought false information, and another 20.8% say that " rarely " so that the percentage of those who did "sometimes" or "almost always" is reduced to 33.4%. The hoaxes on which they intervened came from Twitter or the media, and to a lesser extent from Facebook and WhatsApp. Their effort focused on denying, in this order, fake news related to science, health, and health management. The fact-checking platforms that contacted some of them to verify information are specified in AFP.com, Maldita.es, Newtral, and EFE Verifica.

Becerra, who highlights the "enormous effort" of transformation made by these units to "be original, dynamic, and quick to adapt to the new situation", doubts their effectiveness in combating falsehoods: "the « brother-in-law» effect has a very important permeability ". He acknowledges that they have favored the identification of reliable and top-level scientific sources, however, "there is still work to be done" to become reference sources on scientific issues for the general media and the public.

León discards that they have been a relevant source, because "it is very difficult to counteract the hoaxes that circulate on social networks." López disagrees with this assessment, for whom the UCC+i have become, like the SINC agency, "essential sources of critical and truthful information against the «infodemic»". Zurano refers to the task of this agency, who highlights that it has been "a reference", because it has redirected the main part of its website to content linked to Covid-19 and has responded to "hoaxes or controversial information." Pérez values actions to promote scientific culture more than the denial of hoaxes, which constitutes, according to him, "useless work". The promotion of scientific values is what can "reduce the effectiveness" of disinformation campaigns: "scientific education is an essential element in the preservation of democratic societies, and in a more sustainable and fair development of them." It is an appreciation shared by Becerra, who adds that it is a long-term task, but essential to pave the way and achieve a society "with a greater scientific culture."

Directors are "satisfied" (47.8%) or "very satisfied" (21.7%) with the impact that their UCC+i and its researchers have had on the media. Those who have placed themselves in this attitude declare that they have been the reference unit of their university during the pandemic, offering a wide repertoire of experts and online resources to enhance knowledge of the disease and the health situation. Only 4.3% say they feel "dissatisfied". In this case, the unit argues that the journalists have not addressed them directly. "The appearances in the media (few) derive from the researchers having written an article or that we have sent a press release about a study on Covid-19," they explain.

When asked if they undertook network actions to increase efficiency, 75% acknowledge that there were no synergies. Would it have been relevant, in this

"infodemic" situation, to establish a single address to better position the experts' messages? Bienvenido León considers it "a good idea, but I don't know if it would have been effective. The dimensions of the problem are so great that it does not seem easy to tackle it." Pérez assures that it could be an "interesting solution", although complex. He recalls how difficult it was to achieve small collaborations between autonomous health systems at the most critical moments of the pandemic.

López argues the high number of existing departments and their main dedication, which is the dissemination of results, to reject the idea, which he calls "counterproductive and a drag on the immediacy of the messages that a situation such as the one experienced requires". Zurano also sees it as unfeasible: "an institutional loudspeaker could have been generated, but putting the bell on this cat is really complicated." Becerra expresses himself in similar terms: "There are many «free souls» in the world of researchers, also some «stars» who have wanted to position themselves". He doubts that a coordinating figure would have had authority: "in some cases we only share acronyms."

### 4.4. Learned lessons

87.5% promoted new initiatives through their web portals compared to 12.5% who did not. Among these, seminars or contests, popular science blogs, Cinema with Science, talks by researchers, videos of scientists or dissemination cycles on Facebook, Twitter, or YouTube (#CienciaDesdeCasa), videoconferences open to the public, seminars, educational projects for schoolchildren, a television series for elementary school children, design of teaching materials, "Disclosing in times of confinement" -where researchers exposed their fields of study-, podcast ("Clandestine Science"), fundraising campaigns, games, challenges, or newsletters. This dizzying emergence of formats and content makes Becerra think that the influence of these departments has increased: "We have been «discovered» by various people, both inside and outside the institution [...] Educational centers have also found a medium in us to obtain material, resources, and expert voices to help them".

The biggest challenge for these units has been to rethink how to continue fulfilling their functions in an online environment when most of them were face-to-face. It has been their main weakness, as many of their actions could not be accommodated. They point out other shortcomings, such as the lack of material and human resources, time and experience in teleworking, not having experts in the areas of knowledge demanded by the media, not becoming the voice of the research, lack of time of the research staff, who had to adapt their long-distance classes and who were also unaware or did not have licenses or webinar tools, the reconciliation of family and professional life, and the establishment of work routines.

Their main strength was their ability to react, followed by the availability of technological means, which allowed them to develop quality activities, promote transmedia content, and gamification. Likewise, teamwork, the willingness and availability of researchers to disseminate science, and coordination with other services of their dependency center favorably contributed.

To improve in the face of future crises, the majority proposes to increase virtual activities and strengthen digital content generation platforms, greater coordination between units to promote networking, share resources and improve communication, enhance expert guidance and motivate researchers more, expand personal and technical resources, and strengthen relationships with the media.

It is precisely on this last issue that León has an impact, who suggests seeking a greater presence in the media to reach "larger groups of citizens". Pérez suggests the need to devise educational and promotional actions, as well as to develop crisis communication strategies for the future. Future that, for now, López prefers not to venture, at least until there is a debate among professionals in the field, because "there is a lack of perspective".

Zurano focuses the improvements on greater coordination to develop joint and collaborative projects. Becerra reflects on the new methodologies and routines that "have come to stay", such as teleworking, video calls, or shared documents: "the development of virtual activities, live or deferred, has opened a new universe of possibilities, without detracting from and without competing with those that we will continue to do face-to-face".

## 5. CONCLUSIONS

This work has made it possible to know the impact of Covid-19 on the UCC+i during the state of alarm, so the proposed objective has been met. The activity of these departments, mostly headed by women, small in size, with little personnel and budget, was monopolized by the pandemic, widely disseminated. They adopted an active attitude as a source of information and acted more ex officio than at the request of the media. As a consequence of the confinement and suspension of face-to-face activities, they adapted quickly, and besides using the usual communication resources of press releases or social networks, 87.5% promoted new initiatives, products, and innovative narratives through the Internet.

They transferred R+D+i results related to Covid-19, scientific knowledge of the virus, or the consequences of all kinds that it caused. Denying false information was not among their priorities –only 33.4% claim to have done so– but they did reinforce messages from official institutions (83.3%). Their repercussion in the media was, above all, of local and regional scope, in social networks, and the digital press, under the news format and with scientists as protagonists. Almost 70% said they were satisfied with the media coverage.

Despite the omnipresence of scientists in the media, the relevance of these units as expert sources did not improve regarding the "medium" or "high" position they occupied before the state of alarm (82.6%). They were useful in providing reliable and truthful voices, but they fell far short of effectively responding to the state of "infodemic", which emerged suddenly and forced to rethink methods, routines, and discourses.

The uniqueness of each of these departments made it impossible to offer coordinated actions or establish synergies to amplify their messages. Each unit responded with its own means to the challenge of disinformation. No single address was sought which, as suggested by several interviewees, would have been recommended. Some were openly opposed, and others, although favorable, acknowledge the difficulty of its implementation.

The process of adaptation to the virtual environment and the lack of material and human resources were their greatest threat, although their ability to react, when only 37.5% had a crisis communication plan, was one of their strengths, as well as the technological availability and the predisposition of the researchers. Among the challenges to implementing their effectiveness are the digitization of their activities, the innovation of formats and narratives in online environments, strengthening coordination and communication, and strengthening relations with the media.

The first initial hypothesis is only partially confirmed. Covid-19 has monopolized their communication during the state of alarm. Their messages were part of the media landscape, but their role as expert sources was not reinforced. The media and fact-checking platforms did not seek their qualified opinion to verify false information. There is room for deep reflection on the role of these departments in the media and digital sphere. The need to share knowledge urgently cannot detract from their efforts to expand scientific culture. However, it should be part of their future strategies. The response to disinformation must have medium and long-term objectives, yes, but also more immediate ones. The Covid-19 crisis is an opportunity to learn and establish mechanisms that prove the dominant position of these sources.

The impact of the coronavirus has meant the greatest transformation they have experienced in their scientific communication models. Thus, we corroborate the second hypothesis. There has been a real disruption that has caused an abrupt evolution from the use of traditional media to radically new ones. This disruption, of different scope in each one of them, and which will take time to consolidate, has gone beyond digitization and must be used by organizations to evaluate and redirect resources, processes, and priorities. When examining them, it is worth asking which are viable, what new products should be introduced to spread scientific culture, or how to transfer the work of researchers to society.

One of the limits of this research is the response rate (n=23 of 104). Although we consider that it is representative, reliable, and valid because it guarantees the diversity of the analyzed units, as well as the qualified opinion of both their management and experts and good connoisseurs of this network, it could have been completed with a larger sample. However, we are convinced that this pioneering research, which makes a relevant contribution to the academic and professional fields, will serve as the basis for future ones that seek to explore the development of scientific dissemination.

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